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Subject: Amber Forestier shared "rpt_wildwood_vwp_20210201.pdf" with you
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NOVEC Wildwood Substation Permit Application

VA Department of Environmental Quality VWP 2

U.S. Army Corps of Engineers 17-SPGP-01

January 26, 2021

Prepared for:

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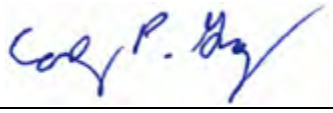
Reviewed by 

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Corey Gray

Approved by 

(signature)

Loretta Cummings, PhD

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Executive Summary

The applicant, Northern Virginia Electric Cooperative (NOVEC), is proposing to develop the Wildwood Substation on a parcel totaling approximately 27.60 acres (ac) which is located within the Goose Creek drainage basin in Loudoun County, Virginia. The site is situated northeast of Sycolin Road (Route 643), south of the Dulles Greenway (Route 267), west of Belmont Ridge Road (Route 659), and can be accessed via Sycolin Road (see Appendix B, Figures 1 & 2). The site contains 1.75 ac of palustrine emergent wetlands (PEM), 3.12 ac of palustrine forested (PFO) wetlands, 1,105 linear feet (LF) (0.20 ac) of intermittent streams, and 2,311 LF (0.22 ac) of perennial streams. The project contains unnamed tributaries which flow into Goose Creek, part of the Middle Potomac-Catoctin watershed, and is within the Hydrologic Unit Code (HUC) 02070008.

NOVEC is proposing to construct a new substation in order to adequately serve continued residential and commercial growth in their Loudoun County service area. The substation will also improve reliability in the service area as a back-up for two existing Dominion Energy substations. As a result of constructing the project, unavoidable permanent impacts to 0.38 ac PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) intermittent streams are proposed. A joint permit application (JPA) is provided in Appendix A. To compensate for unavoidable permanent impacts to jurisdictional waters, the applicant proposes to purchase 0.99 wetland credits from the Cedar Run Wetlands Bank and 559 stream credits, in the form of 1,082 stream credit units from the Northern Virginia Stream Restoration Bank which is approved to service HUC 02070008.

The applicant is seeking authorization to discharge fill material into a total of 0.38 ac PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) intermittent streams from Virginia Department of Environmental Quality (DEQ) under the Virginia Water Protection (VWP) General Permit WP 2 pursuant to Section 401 of the Clean Water Act and §§62.1-44.15 and 62.1-44.15:5 of the Code of Virginia and from the U.S. Army Corps of Engineers (Corps) with coverage under the State Programmatic General Permit 17-SPGP-01, pursuant to Section 404 of the Clean Water Act (33 USC 1344). A permit from the Virginia Marine Resources Commission (VMRC) will not be required as the drainage area to the streams within the project area is less than 5 square miles.

Abbreviations

ac	Acre
BMP	Best Management Practices
Corps	U.S. Army Corps of Engineers
DCR	Virginia Department of Conservation and Recreation
DEQ	Virginia Department of Environmental Quality
DWR	Virginia Department of Wildlife Resources
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
HUC	Hydrologic Unit Code
IPaC	U.S. Fish and Wildlife Information for Planning and Conservation
JPA	Joint Permit Application
LEDPA	Least Environmentally Damaging Practicable Alternative
LF	Linear feet
kV	Kilovolts
MW	Megawatts
NRHP	National Register of Historic Places
PEM	Palustrine Emergent Wetlands
PFO	Palustrine Forested Wetlands
PJD	Preliminary Jurisdictional Determination
POW	Palustrine Open Water
PSS	Palustrine Scrub-Shrub Wetlands
sf	Square Feet
SWM	Stormwater Management
USFWS	U. S. Fish and Wildlife Services
VaFWIS	Virginia Fish and Wildlife Information Service
VDHR	Virginia Department of Historic Resources
VMRC	Virginia Marine Resources Commission
VNHDE	Virginia Natural Heritage Data Explorer (VNHDE)
VSMP	Virginia Stormwater Management Program
VWP	Virginia Water Protection Permit

1.0 PROJECT INFORMATION

1.1 PROJECT LOCATION

The proposed project, NOVEC Wildwood Substation, is located within the Goose Creek drainage basin in Loudoun County, Virginia. The 27.60 acre (ac) site is situated northeast of Sycolin Road (Route 643), immediately south of the Dulles Greenway (Route 267), west of Belmont Ridge Road (Route 659), and can be accessed via Sycolin Road (see Appendix B, Figures 1 & 2) near the Town of Leesburg. The project contains unnamed tributaries which flow into Goose Creek, part of the Middle Potomac-Catoctin watershed, and is within the Hydrologic Unit Code (HUC) 02070008.

1.2 PROJECT DESCRIPTION

NOVEC currently services over 40,000 customers in Loudoun County including the Town of Leesburg. The proposed utility distribution substation and switching station will be served by an existing, recently upgraded Dominion Energy 230 kilovolt (kV) transmission line installed on lattice steel tower structures that transverses a portion of the property. There are two (2) proposed electrical taps on the existing 230 kV transmission line which dictate the orientation of the equipment in order to meet horizontal and vertical clearances. The equipment onsite will be surrounded by 12-foot tall mesh fencing to limit access. The main access road for the site will follow the existing access road within the Dominion Energy easement and will be a 24 -foot wide gravel road. There will be two (2) points of access for the substation. The northern access for maintaining the electrical equipment will require the existing entrance to be widened to 38 feet to allow larger equipment to maneuver and an access road for maintenance of the stormwater infrastructure will be located along the southern edge of the pad site. The maintenance access road will be 24 feet wide. The parcel contains an existing Dominion Energy transmission line and easement on the northwest portion of the site. The overall project area is 11.66 ac, including construction of the access roads, the pad site, and the stormwater management facilities. The project proposes permanent impacts to 0.38 ac of PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) of intermittent streams. A joint permit application for the project (JPA) is provided in Appendix A.

The substation will ultimately be equipped with four 100-megavolt ampere (MVA) power transformers controlling fourteen to twenty distribution circuits. In order to build a substation on the property, NOVEC completed multiple studies including a wetland delineation and a Phase I Architectural and Archeological study at the request of the county. Applications for special use permits were submitted to Loudoun County in April of 2019. Loudoun County approved a Commission Permit on October 22, 2019 and a Special Exception on December 11, 2019.

1.3 PROJECT PURPOSE & NEED

The purpose of the electrical distribution substation is to 'step down' high voltage electricity from a transmission line to a lower voltage electricity which is in turn supplied to homes and businesses through

NOVEC's distribution lines. The substation will provide the capacity needed to meet the demand spurred by commercial, industrial, and residential growth within the service area.

The population growth in Loudoun County is the highest in Virginia at more than 30% since the last census in 2010 (Table 1). It is growing faster than all the surrounding counties of Fairfax, Fauquier, and Prince William. This growth has spurred the housing, commercial, industrial and job markets in Loudoun County which has in turn increased the need for additional electrical supply.

Table 1 Northern Virginia Census Information

Locality	April 1, 2010 Census	July 1, 2018 Estimate	Change since 2010 Census	
			Numeric Change	*Percent Change*
Virginia	8,001,024	8,517,685	516,661	6.5%
Fairfax County	1,081,699	1,145,978	64,279	5.9%
Fauquier County	65,203	70,150	4,947	7.6%
Loudoun County	312,311	406,355	94,044	30.1%
Prince William County	402,002	463,046	61,044	15.2%

*Weldon Cooper Center for Public Service Demographics Research Group https://demographics.coopercenter.org

NOVEC describes itself as: "…one of the largest electric cooperatives of its kind in the United States, is a customer-owned and locally based distribution system that provides electricity to residents and businesses throughout Northern Virginia. NOVEC's service territory encompasses 651 square miles and includes portions of Clarke, Fairfax, Fauquier, Loudoun, Prince William, and Stafford counties, the City of Manassas Park, and the Town of Clifton. NOVEC is a supply and distribution electric cooperative and purchases wholesale power." NOVEC's service area within Loudoun County in the vicinity of the proposed substation is shown in Figure 1.

NOVEC'S projected load for the next three years exceeds its available capacity in the area surrounding the proposed substation and Loudoun County anticipates the development of high energy demand projects including industrial parks, data centers and residential developments within the NOVEC service area which would be served by the substation. The proposed substation will be connected to an existing Dominion Energy 230 kV transmission line installed on lattice steel tower structures that crosses the property. There are no existing substations along the power lines within 2 miles. The closest existing substations are located along the recently upgraded Loudoun to Pleasant View 500 kV Line #588 and are owned and operated by Dominion Energy. The Goose Creek/Pleasant View Stations are located approximately 2.14 miles to the north and the Brambleton Station is located approximately 5.70 miles to the south. The Wildwood Substation will ultimately be able to provide this projected high-demand area with 300 million volt amperes (MVA) of additional capacity with 14 to 20 new distribution circuits required to serve this projected high-demand area. This will improve reliability of the electric grid in Loudoun County and potentially decrease response time during outages in this part of Ashburn.

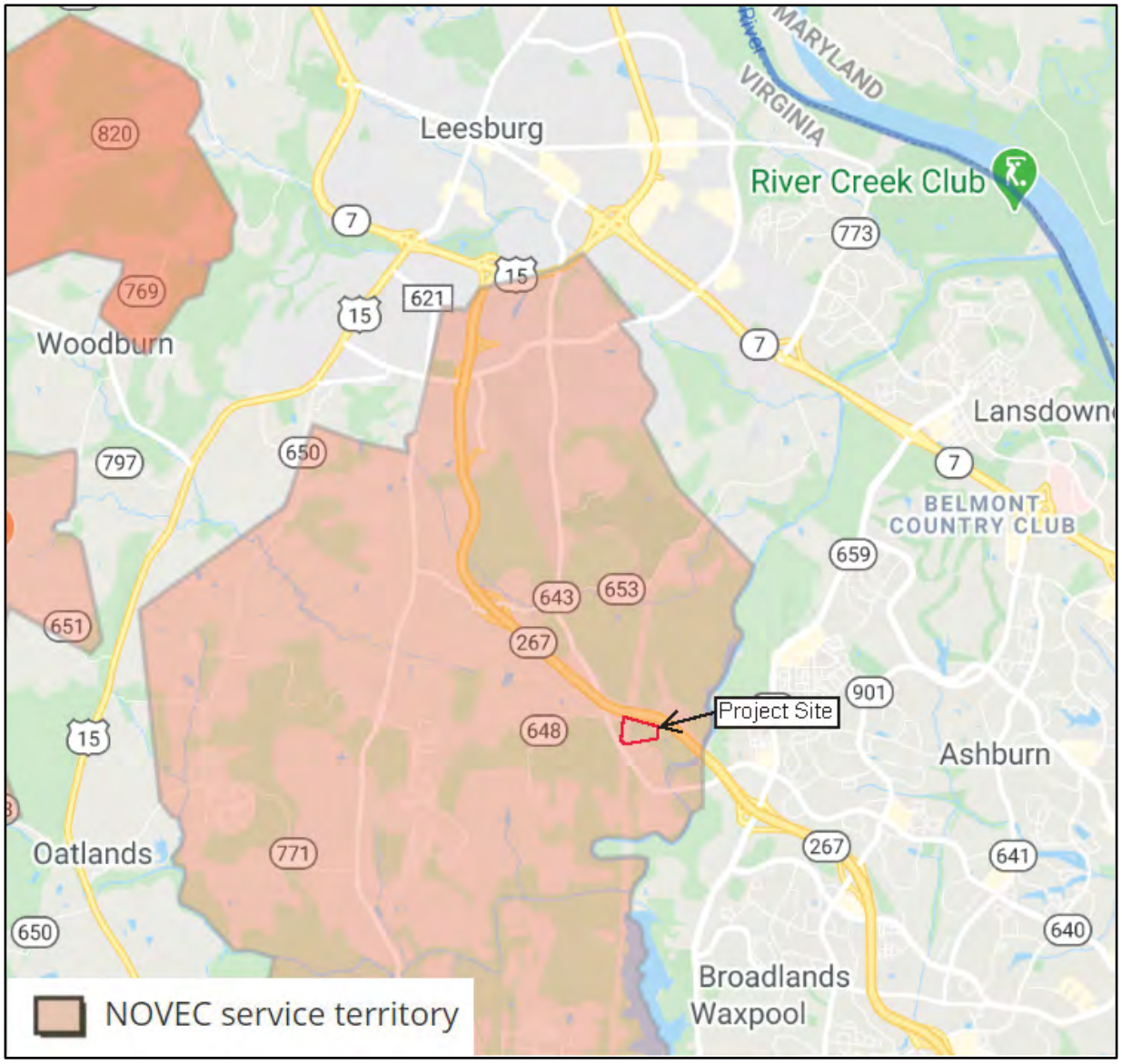

Figure 1 Local NOVEC Service Area

2.0 ANALYSIS OF ALTERNATIVES

The proposed Wildwood Substation needs to be located along an existing electrical distribution line in Loudoun County in order to distribute electricity within a segment of NOVEC's service area that requires additional capacity. The selected parcel is owned by the applicant and includes 27.59 ac just to the south of the Dulles Greenway (SR 267) and north of Sycolin Road (Appendix B Figures 1 & 2). The parcel is zoned Transitional Residential-10 (TR10); therefore, special use permits were acquired from the County. The applicant has completed applications for special use permits and associated studies which were submitted to Loudoun County in April of 2019 and approved in October and December of 2019. A Dominion Energy powerline passes through the property within a region that requires additional capacity and the parcel is within the NOVEC service area (Figure 1).

Four site layouts were considered to minimize the impacts to onsite streams and wetlands while still allowing for the construction of the large building pad required to meet the project needs. The orientation of the project components in the selected alternative are based on Dominion Energy requirements for connection of substation components to the powerline. The alternatives are compared based on the amount and types of permanent impacts proposed.

2.1 PREFERRED ALTERNATIVE

The Preferred Alternative is a result of the comments received during the pre-application meeting conducted with the agencies on April 24, 2020. The total project impacts have been reduced below the 1-ac Individual Permit threshold and the project is now proposed to be permitted under a VWP 2 from DEQ and the SPGP-01 for the Corps. With final engineering, the grading on the northeast side of the pad site has been further minimized, impacts to wetlands and the stream channel on the south side have been minimized, and the connection to the main electrical lines has been moved avoiding conversion impacts to PFO wetlands. Impacts to the perennial stream system were completely avoided and the stormwater management for the site has been designed to minimize grading impacts through the use bioretention and underground storage tanks instead of stormwater ponds. Most of the remaining impacts are caused by, or in direct response to, the mass grading required to construct the pad site. The southern access road has been realigned and grading minimized to avoid the majority of the PFO wetlands and the intermittent stream on the south side of the site, while maintaining a connection to the perennial stream. The access road crossings in the wetland areas include pipes in order maintain the hydrologic connection within the wetland complex. The Preferred Alternative results in impacts to a total of 0.38 ac PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) intermittent streams (Table 6). The impacts associated with the Preferred Alternative are shown on Figure 3 in Appendix B.

Table 2 Preferred Alternative Impacts

IMPACT	WETLANDS (AC)		STREAM CHANNELS	
	PFO (SF)	PEM (SF)	R4 (SF)	R4 (LF)
PG1	-	162	-	-
PG2	7,562	-	-	-
PG3	93	-	327	77
PG4	1,744	-	925	238
PR1	163	7,106	-	-
PR2	-	2,815	-	-
PR3	423	-	1,162	194
TOTAL	**16,369**	**10,083**	**1,252**	**509**
	0.38 AC	**0.23 AC**	**0.03 AC**	

2.2 ALTERNATIVE 1

The first alternative was based on the concept plan for the project which did not include the access road. Alternative 1 include 0.86 ac PFO wetlands, 0.15 ac PEM wetlands, and 1,039 LF (0.10 ac) intermittent stream channel (Table 3). The Alternative 1 Impacts Map is in Appendix B as Figure 16.

Table 3 Alternative 1 Impacts

IMPACT	WETLANDS (AC)		STREAM CHANNELS	
	PFO (SF)	PEM (SF)	R4 (SF)	R4 (LF)
PG1	1,800	-	-	-
PG2	678	-	-	-
PG3	95	-	324	76
PG4	1,744	-	753	199
PG5	33,107	6,711	3,089	764
TOTAL	**37,424**	**6,711**	**4,166**	**1,039**
	0.86 AC	**0.15 AC**	**0.10 AC**	

2.3 ALTERNATIVE 2

Alternative 2 included the required substation equipment, incorporated stormwater management and the permanent entrance road was widened to meet code requirements and realigned due to the locations of existing towers. Although the alternative includes a retaining wall along the northeast side of the pad site, the impacts increase to 0.80 ac PFO wetlands, 0.34 ac PEM wetlands and 1,062 LF (0.10 ac) intermittent stream channel. This increase occurs because the entire wetland and intermittent stream complex on the

south side of the parcel would be filled in order to avoid impacts to the perennial stream that flows through the property. The impacts associated with Alternative 2 are shown on Figure 17 in Appendix B.

Table 4 Alternative 2 Impacts

IMPACT	WETLANDS (AC)		STREAM CHANNELS	
	PFO (SF)	PEM (SF)	R4 (SF)	R4 (LF)
PG1	257	-	-	-
PG2	640	-	-	-
PG3	64	-	316	73
PG4	1,744	-	954	242
PG5	32,173	8,646	3,079	747
PR1	-	6,255	-	-
TOTAL	**34,878**	**14,901**	**4,349**	**1,062**
	0.80 AC	**0.34 AC**	**0.10 AC**	

2.4 ALTERNATIVE 3

Alternative 3 for the project involved changes in the orientation of the substation at the request of Dominion Energy due to the need for two (2) electrical taps at a certain location on the existing 230 kV transmission line. This orientation of the substation is most effective to meet horizontal and vertical clearances. Once the site was re-oriented, avoidance of the perennial stream system was made easier and the engineers were able to shift the pad site as far to the northern parcel line as possible, based on the 150-foot-wide setback required by Loudoun County. In this scenario, the retaining wall would be located downslope of a wetland complex which may affect the stability of the wall.

Table 5 Alternative 3 Impacts

IMPACT	WETLANDS (AC)		STREAM CHANNELS	
	PFO (SF)	PEM (SF)	R4 (SF)	R4 (LF)
PG1	23,110	940	168	80
PG2	202	-	352	85
PG3	111	-	-	-
PG4	1,744	-	968	244
PG5	10,894	7,296	-	-
PR1	-	6,674	-	-
TOTAL	**36,061**	**14,910**	**1,488**	**408**
	0.82 AC	**0.34 AC**	**0.03 AC**	

The southern limits of grading shifted to completely avoid the southern intermittent stream channel, but the impacts to PFO wetlands increase. This alternative would result in impacts to a total of 1.16 ac wetlands and 408 LF (0.03 ac) streams. Wetland impacts include 0.82 ac PFO wetlands, 0.34 ac PEM wetlands, and 408 lf intermittent stream channel (Table 5). The impacts associated with Alternative 3 are shown on Figure 18 in Appendix B.

2.5 ALTERNATIVE 4 (PRE-APPLICATION PREFERRED ALTERNATIVE)

Alternative 4 was presented as the Preferred Alternative during the pre-application meeting held on April 24, 2020 and had been selected for a number of reasons. With additional engineering, the location of the retaining wall on the northeast side of the pad site had to be relocated in order to avoid constructing it in an area which would receive groundwater flow from the large wetland complex to the north and west. The grading required to construct a retaining wall which will be 8.6 feet tall at its highest point results in a shift of the pad site to the south. When compared to Alternative 3, this alternative has increased impacts to the intermittent stream segment on the south side of the project. During the meeting it also became apparent that there would be additional conversion impacts to PFO wetlands associated with connecting the substation to the main line on the northern side of the site. This alternative would result in impacts to a total of 0.77 ac PFO wetlands, 0.35 ac PEM wetlands and 759 LF (0.07 ac) intermittent streams (Table 6). The impacts associated with Alternative 4 are shown on Figure 19 in Appendix B.

Table 6 Alternative 4 Impacts

IMPACT	WETLANDS (AC)		STREAM CHANNELS	
	PFO (SF)	PEM (SF)	R4 (SF)	R4 (LF)
PG1	-	127	-	-
PG2	9,165	-	-	-
PG3	92	-	326	77
PG4	1,744	-	927	239
PG5	93	-	-	-
PG6	22,549	8,288	1,663	443
PR1	-	6,674	-	-
TOTAL	**33,643**	**15,089**	**2,916**	**759**
	0.77 AC	**0.35 AC**	**0.07 AC**	

2.6 COMPARISON OF ALTERNATIVES

The orientation of the pad site in Alternatives 1 and 2 would result in filling the entire wetland and stream complex on the south side of the parcel in order to avoid impacts to the perennial stream that flows through the property. With a change in the orientation of the pad site, Alternative 3 would decrease the impacts to stream channels but is not feasible due to the location of wetlands directly behind the proposed retaining wall. Alternative 4 would decrease the impacts to wetlands on the north side of the site

but resulted in a shift of the pad site to the south which would increase impacts to a wetland complex and the southernmost intermittent stream. The Preferred Alternative decreases the overall impacts. Impacts to PFO wetlands have been decreased from 0.77 ac to 0.38 ac, impacts to the intermittent streams have been decreased from 759 LF (0.07 ac) to 509 LF (0.03 ac) and impacts to the perennial stream have been avoided. The Preferred Alternative minimizes impacts to intermittent streams and maintains connections between the wetland complexes and is the Least Environmentally Damaging Practicable Alternative (LEDPA).

Table 7 Comparison of Alternatives

ALTERNATIVE	WETLANDS (AC)		STREAM CHANNELS	
	PFO (AC)	PEM (AC)	R4 (AC)	R4 (LF)
PREFFERED	**0.38**	**0.23**	**0.03**	**509**
1	0.86	0.15	0.10	1,039
2	0.80	0.34	0.10	1,061
3	0.82	0.34	0.03	408
4	0.77	0.35	0.07	759

3.0 AVOIDANCE AND MINIMIZATION

With the Preferred Alternative, impacts to the perennial stream system are completely avoided and the stormwater management for the site has been designed to minimize grading impacts through the use bioretention and underground storage tanks instead of stormwater ponds. The Preferred Alternative impact map is provided in Appendix B on Figure 3 and the cut-sheets are shown on Figure 4. The majority of the impacts are caused by, or in direct response to, the mass grading required to construct the pad site and the attendant stormwater management facilities. As a result of the pre-application meeting, pipes have been added to allow a connection between the wetlands on both sides of the main access road. The southern access road has also been realigned and grading minimized to avoid the majority of the PFO wetlands and the intermittent stream on the south side of the site, while maintaining a connection to the perennial stream.

All impacts are permanent (P) and further indicated by road (R) or grading (G) impacts.

3.1 IMPACT PG1

Impact PG1 will permanently impact 162 sf of PEM wetlands and is associated with the construction of the drainage and stormwater system on northern side of the pad site where a 24-foot wide gravel road enters the site for maintenance vehicle access. The plan view is provided on Figure 5 in Appendix B.

3.2 IMPACT PG2

Impact PG2 is associated with the construction of the northern side of the gravel pad site which will allow vehicle access and parking as well as a portion of the NOVEC substation equipment. Impact PG2 will permanently impact 7,562 sf of PFO wetlands. The plan view is provided on Figure 5 in Appendix B and a cross-section is provided on Figure 6.

3.3 IMPACT PG3

Impact PG3 is associated with the construction of an 8.6-ft tall retaining wall on the northeast corner of the pad site. The wall was designed to avoid impacts to the perennial stream. Impact PG3 will permanently impact 93 sf of PFO wetlands and 77 lf (327 sf) of intermittent stream channel. The plan view is provided on Figure 7 in Appendix B and a cross-section is provided on Figure 8.

3.4 IMPACT PG4

Impact PG4 is associated with the substation pad site, stormwater management pipes, bioretention facilities and grading to maintain a stable slope along the perennial stream system. Impact PG4 will permanently impact 1,744 sf of PFO wetlands and 238 LF (925 sf) of intermittent stream channel. The plan view is provided on Figure 7 in Appendix B and a cross-section is provided on Figure 8.

3.5 IMPACT PG5

Impact PG5 is associated with construction of the southwestern side of the gravel pad site. Impact PG6 will permanently impact 6,807 sf of PFO wetlands. A riprap outfall 10-ft wide by 8-ft long containing a v-ditch and level-spreader will be constructed at the end of the slope to dissipate concentrated flow. The plan view is provided on Figure 12 in Appendix B; a cross-section is provided on Figure 13 and a level spreader detail is provided on Figure 15.

3.6 IMPACT PR1

Impact PR1, associated with the main access road, consists of two separate culvert crossings which will permanently impact 163 sf of PFO wetlands and 7,106 sf of PEM wetlands. The entrance for the access road has been minimized based on the minimal width of the parcel connection to Sycolin Road and the alignment has been curved in order to minimize the impacts to wetlands. The connection between the wetlands on the west side of the road and the east side will be maintained through the installation of two RCPs. The first pipe (PR1A) will be a 15-inch RCP and approximately 57 ft in length with a riprap outfall 11.75-ft wide by 10-ft long. A level spreader is not needed at this crossing as the pipe slope will only be 0.53%. The second pipe (PR1B) has a slope of more than 4% and will consist of a 15-inch RCP and approximately 60 ft in length with a riprap outfall 10-ft wide by 8-ft long containing a v-ditch and level-spreader to dissipate concentrated flow that may pass through the pipe. The plan view is provided on Figure 9 in Appendix B; the pipe profiles are provided on Figure 10; and a level spreader detail is provided on Figure 15.

3.7 IMPACT PR2

Impact PR2 is associated with the main access road and will permanently impact 2,815 sf of PEM wetlands. The entrance for the access road has been minimized based on the minimal width of the parcel connection to Sycolin Road and the alignment has been curved in order to minimize the impacts to wetlands. The connection between the wetlands on the west side of the road and the east side will be maintained through the installation of a 15-inch RCP approximately 60 ft in length with a riprap outfall 10-ft wide by 8-ft long containing a v-ditch and level-spreader to dissipate concentrated flow that may pass through the pipe. The plan view is provided on Figure 9 in Appendix B; the pipe profile is provided on Figure 11; and a level spreader detail is provided on Figure 15.

3.8 IMPACT PR3

Impact PR3 is associated with the construction of a 24 ft wide gravel access road for maintenance of the stormwater facilities on the eastern side of the padsite and will permanently impact 423 sf of PFO wetlands and 194 LF (1,162 sf) of two intermittent stream channels. The road crossing includes the installation of a 24-inch RCP approximately 115 ft in length with a riprap outfall 15 ft wide by 13 ft long. An adequately sized pump-around will be used to ensure that construction occurs in the dry. The access road was realigned to the south of the wetland and stream complex and to the north of the perennial stream in order to limit impacts to one road crossing. This also allowed the grading for the southwest

corner of the padsite to be reconfigured and reduced to minimize wetland impacts (Impact PG5). The plan view is provided on Figure 12 in Appendix B and a pipe profile is provided on Figure 14.

3.9 SUMMARY OF IMPACTS

In summary, the applicant is proposing to permanently impact total of 0.38 ac PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) intermittent streams (Table 16).

Table 8 Permanent Impacts

IMPACT	WETLANDS (AC)		STREAM CHANNELS	
	PFO (SF)	PEM (SF)	R4 (SF)	R4 (LF)
PG1	-	162	-	-
PG2	7,562	-	-	-
PG3	93	-	327	77
PG4	1,744	-	925	238
PG5	6,807			
PR1	163	7,106	-	-
PR2	-	2,815	-	-
PR3	423	-	1,162	194
TOTAL	**16,369**	**10,083**	**1,252**	**509**
	0.38 AC	**0.23 AC**	**0.03 AC**	

The design team has made every effort to minimize impacts to on-site jurisdictional areas while still meeting the project purpose and need. Appropriate and necessary steps have been taken to minimize potential adverse impacts resulting from the discharge of fill into the aquatic ecosystem. This project is not expected to impact a public water supply, any shellfish harvesting area, spawning grounds, waterfowl habitat; nor jeopardize threatened or endangered species of which we are aware; nor disrupt the movement of aquatic life. Therefore, this activity should not cause or contribute to the significant degradation of waters of the United States, nor should the activity adversely or substantially affect human health or welfare; life stages of organisms dependent upon the aquatic ecosystem; ecosystem diversity, productivity, or stability; or significantly degrade recreational, aesthetic, or economic values.

3.10 STORMWATER PLANNING

The following is a summary of the conceptual SWM/BMP analysis and design for the project. The required total phosphorous (TP) load reduction rate for the project is 12.73 lb/yr. To meet the required rate three (3) bioretention facilities and a Stormtech system with an isolator row will be constructed on the eastern side of the padsite. The bioretention facilities will feed into a Stormtech system which creates a treatment train in order to meet the TP load removal requirements. The combination of the bioretention facilities and the Stormtech isolator row, provides a TP reduction of 9.66 lb/yr. The remaining TP load reduction required (3.07) will be achieved through the purchase of offsite credits. With the onsite

improvements, bioretention facilities, Stormtech system, and the offsite nutrient credit purchases, the project will meet the required TP removal load reduction. A copy of the stormwater management plan is located in Appendix C.

4.0 ENVIRONMENTAL INFORMATION

4.1 DELINEATION INFORMATION

Jurisdictional Waters of the United States within the project area were delineated by Stantec ecologists, in accordance with *1987 Corps of Engineers Wetland Delineation Manual and methods described in the 2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region* (Version 2.0). The delineation was confirmed by the Corps in the preliminary jurisdictional determination (PJD) dated April 8, 2019. A copy of the confirmation letter, datasheets, and delineation map are enclosed in Appendix D. As a result, a total of 1.75 ac PEM wetlands, 3.12 ac PFO wetlands, 1,105 lf (0.20 ac) perennial streams, and 2,311 lf (0.22 ac) intermittent streams are located within the project area.

Jurisdictional features identified by Stantec within the project limits may be classified as palustrine forested and emergent wetlands along with associated non-vegetated stream channels. Wetland vegetation is typified by green ash (*Fraxinuns pennsylvanica*), red maple (*Acer rubrum*), American sweetgum (*Liquidambar styraciflua*), northern spicebush (*Lindera benzoin*), Japanese stiltgrass (*Microstegium vimineum*), common rush (*Juncus effusus*), shallow sedge (*Carex lurida*), seedbox (*Ludwigia alternifolia*), and roundleaf greenbriar (*Smilax rotundifolia*). The transition from wetland to upland is generally identified by a shift in the vegetative community and a shift from hydric to non-hydric soils.

4.2 100-YEAR FLOODPLAIN

A map depicting the floodplain based on the Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM) Panel 511107C0245E, dated February 17, 2017 for Loudoun County, Virginia is enclosed (Appendix B – Figure 20). According to the FEMA FIRM, the project area is within a Zone X, an area of minimal flood hazard; therefore, there will be no impacts on the 100-year floodplain.

4.3 THREATENED & ENDANGERED SPECIES

The U.S. Fish and Wildlife Service (USFWS) Information, Planning, and Conservation System (IPaC) database listed the northern long-eared bat (*Myotis septentrionalis*) as federal threatened species with possible habitat in the project area. This application is relying upon the findings of the January 5, 2016 Programmatic Biological Opinion for Final 4(d) Rule on the Northern Long- Eared Bat and Activities Excepted from Take Prohibitions to fulfill the required project-specific Section 7 responsibilities. Initial coordination with USFWS was conducted by Dewberry on February 1, 2019. The self-certification letter and an updated project review package are provided in Appendix E - Threatened and Endangered Species.

The Department of Wildlife Resources (DWR) database, Virginia Fish and Wildlife Information Service (VaFWIS) did not confirm the presence of any federal threatened or endangered species within two miles

of the project area. The state threatened green floater (*Lasmigona subviridis*) was confirmed within two miles. The project area contains only smaller headwater streams, with steep topography displaying hydrological regimes that likely would not support the species. Confirmed observations have all been within Goose Creek, which is separated from this site by a pond, therefore the project is not likely to adversely affect the green floater. The Department of Conservation and Recreation (DCR) Virginia Natural Heritage Database indicated that the state threatened loggerhead shrike (*Lanius ludovicianus*) may have habitat in the vicinity of the project, however VAFWIS indicated that there have been no confirmed observations within two (2) miles of the project area. The printout of the database results can be found in Appendix E.

No bald eagles' nests were identified within a 660-foot radius of the project site. The closest nest was located approximately 5.5 miles to the north from the project site. Due to the existing site conditions, adjacent land uses, and scope of the proposed project, no adverse impacts to threatened, endangered, or rare species are expected.

4.4 CULTURAL RESOURCES

As part of the permitting process for Loudoun County, Stantec conducted an archaeological survey of the project site in February 2019. The Phase I survey was designed to locate and identify cultural resources within the defined project area and to obtain sufficient information to make recommendations regarding their potential eligibility for listing in the National Register of Historic Places (NRHP). The overall project area encompassed approximately 27.59 acres in extent; however, a wetland delineation performed in February of 2019 documented approximately 5.28 acres of actual wetland. As a result, only approximately 22.31 acres of the project area were subject to systematic survey. Phase I survey included pedestrian survey of the entire project area, minus wetlands, conducted concurrently with systematic subsurface testing.

One new isolated archaeological find (1129-IF1) was identified during this investigation (Table 9). By definition, isolated archaeological finds are not eligible for NRHP inclusion. One previously recorded archaeological site (44LD0468) was reidentified. Site 44LD0468 was recorded in 1990 as a prehistoric lithic scatter of indeterminate temporal affiliation. The current survey identified one flake in the site vicinity, resulting in the expansion of the site boundary. Given the paucity of artifacts recovered, the lack of diagnostic material, and the location of the site within wetlands, Stantec recommended Site 44LD0468 as not eligible for listing on the NRHP. In a letter dated May 1, 2020, DHR concurred with Stantec's recommendation. A copy of the letter and the Phase I study are located in Appendix F.

Table 9 Recommendations for Cultural Resources in the Project Area

Resource	Resource Type	Association	Stantec Recommendation
1129-IF1	2 Quartz Flakes	Prehistoric Unknown	Not Eligible; No Further Work
44LD0468	Lithic Scatter	Prehistoric Unknown	Not Eligible; No Further Work

5.0 COMPENSATORY MITIGATION

Compensation is required for permanent impacts to 0.38 ac PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) intermittent streams. Based on the mitigation requirements of 1:1 for PEM wetlands and 2:1 for PFO wetlands, 0.99 wetland credits are required (Table 10). Based on Unified Stream Methodology (USM) scores, the impacts to 509 lf of stream channel will require the purchase of 559 stream credits (Table 11).

Table 10 Compensatory Wetland Mitigation

TYPE	IMPACT (AC)	RATIO	CREDITS
PEM	0.23	1:1	0.23
PFO	0.38	2:1	0.76
Total:	**0.61**	**-**	**0.99**

Compensatory mitigation is proposed to be achieved through the purchase of credits from banks which are approved to service HUC 02070008. The Cedar Run Wetlands Bank currently has 0.99 wetland credits available. Stream credits are proposed to be purchased from the Northern Virginia Stream Restoration Bank which utilizes its own credit assessment methodology known as SIAM (Stream Impact Assessment Method) and requires that a separate stream credit equivalency form be completed. Based on the stream credit equivalency form located in Appendix G, a total of 1,082 stream credit units (SCUs) are required to mitigate for the 509 LF of stream impacts. Letters of credit availability, the stream credit equivalency form and the Unified Stream Methodology worksheets are attached to this application in Appendix G - Compensatory Mitigation.

6.0 CONCLUSION

The applicant is seeking authorization to discharge fill material into a total of 0.38 ac PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) intermittent streams under the Virginia Water Protection (VWP) General Permit WP 2 from DEQ, pursuant to Section 401 of the Clean Water Act and §§62.1-44.15 and 62.1-44.15:5 of the Code of Virginia and coverage under the State Programmatic General Permit 17-SPGP-01 from the Corps, pursuant to Section 404 of the Clean Water Act (33 USC 1344). A permit from the VMRC will not be required as the drainage area to the streams within the project area is less than 5 square miles. To compensate for unavoidable permanent impacts to jurisdictional waters, the applicant proposes to purchase 0.99 wetland credits and 1,082 SCUs.

APPENDIX A – JOINT PERMIT APPLICATION

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FOR AGENCY USE ONLY	
	Notes:
JPA# 21-0279	

APPLICANTS

PLEASE PRINT OR TYPE ALL ANSWERS. If a question does not apply to your project, please print N/A (not applicable) in the space provided. ***If additional space is needed, attach extra 8 ½ x 11 inch sheets of paper.***

Check all that apply			
Pre-Construction Notification (PCN) ☐ NWP # _____ (*For Nationwide Permits ONLY - No DEQ-VWP permit writer will be assigned*)	SPGP ☒	DEQ Reapplication ☐ Existing permit number: _____	Receiving federal funds ☐ Agency providing funding: _____
Regional Permit 17 (RP-17) ☐			

PREVIOUS ACTIONS RELATED TO THE PROPOSED WORK (Include all federal, state, and local pre application coordination, site visits, previous permits, or applications whether issued, withdrawn, or denied)

Historical information for past permit submittals can be found online with VMRC - https://webapps.mrc.virginia.gov/public/habitat/ - or VIMS - http://ccrm.vims.edu/perms/newpermits.html

Agency	Action / Activity	Permit/Project number, including any non-reporting Nationwide permits previously used (e.g., NWP 13)	Date of Action	If denied, give reason for denial
USACE	PJD	NAO-2019-00325	4/8/19	

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION
The applicant(s) is/are the legal entity to which the permit may be issued (see How to Apply at beginning of form). The applicant(s) can either be the property owner(s) or the person/people/company(ies) that intend(s) to undertake the activity. The agent is the person or company that is representing the applicant(s). If a company, please also provide the company name that is registered with the State Corporation Commission (SCC), or indicate no registration with the SCC.

Legal Name(s) of Applicant(s)			Agent (if applicable)		
Northern Virginia Electric Co-op (NOVEC) - Mr. Robert E. Bisson			Stantec Consulting Services Inc. - Amber Forestier		
Mailing address 5399 Wellington Branch Drive			Mailing address 150 Riverside Parkway , Suite 301		
City Gainesville	State VA	ZIP Code 20155	City Fredericksburg	State VA	ZIP Code 22406
Phone number w/area code 703-754-6725	Fax		Phone number w/area code 540-785-5544	Fax 540-785-1742	
Mobile	E-mail rbisson@novec.com		Mobile	E-mail amber.forestier@stantec.com	
State Corporation Commission Name and ID number (if applicable) 02371847			State Corporation Commission Name and ID number (if applicable)		

Certain permits or permit authorizations may be provided via electronic mail. If the applicant wishes to receive their permit via electronic mail, please provide an e-mail address here: amber.forestier@stantec.com

1. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR INFORMATION (Continued)

Property owner(s) legal name, if different from applicant			Contractor, if known		
N/A			N/A		
Mailing address			Mailing address		
City	State	ZIP code	City	State	ZIP code
Phone number w/area code	Fax		Phone number w/area code	Fax	
Mobile	E-mail		Mobile	E-mail	
State Corporation Commission Name and ID number (if applicable)			State Corporation Commission Name ID number (if applicable)		

2. PROJECT LOCATION INFORMATION

(Attach a copy of a detailed map, such as a USGS topographic map or street map showing the site location and project boundary, so that it may be located for inspection. Include an arrow indicating the north direction. Include the drainage area if the SPGP box is checked on Page 7.)

Street Address (911 address if available)	City/County/ZIP Code
N/A - SE of intersection SR 267 (Dulles Greenway and Sycolin Rd)	Leesburg, VA 20175
Subdivision	Lot/Block/Parcel #
N/A	61-16A

Name of water body(ies) within project boundaries and drainage area (acres or square miles).
Tributeries to Goose Creek; D.A. 0.19 square miles

Tributary(ies) to: Goose Creek
Basin: Potomac Sub-basin: Middle Potomac-Catoctin
(*Example: Basin: James River Sub-basin: Middle James River*)

Special Standards (based on DEQ Water Quality Standards 9VAC25-260 et seq.): None

Project type (check one)

_____ Single user (private, non-commercial, residential)
__X__ Multi-user (community, commercial, industrial, government)
_____ Surface water withdrawal

Latitude and longitude at center of project site (decimal degrees): 39.046639 / -77.540231
(Example: 37.33164/-77.68200)

USGS topographic map name: Leesburg, VA 2019

8-digit USGS Hydrologic Unit Code (HUC) for your project site (See http://cfpub.epa.gov/surf/locate/index.cfm): 02070008
If known, indicate the 10-digit and 12-digit USGS HUCs (see *http://dswcapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm* :
0207000807 020700080702

Name of your project (*Example: Water Creek driveway crossing*) Wildwood Substation

Is there an access road to the project? ☑ Yes ☐ No. If yes, check all that apply: ☑ public ☑ private ☑ improved ☑ unimproved

Total size of the project area (in acres): 27.6

2. PROJECT LOCATION INFORMATION (Continued)

Provide driving directions to your site, giving distances from the best and nearest visible landmarks or major intersections:

From I-495 North, use the left lane to take Exit 45 to take Dulles Toll Road (VA-267 W). After 19 miles, use Exit 4 and then keep right at the fork to merge onto VA-659/Belmont Ridge Road. In 0.3 miles, turn left onto Sycolin Road. Project area is located 1.5 miles down on the left.

Does your project site cross boundaries of two or more localities (i.e., cities/counties/towns)? ☐ Yes ☑ No
If so, name those localities:

3. DESCRIPTION OF THE PROJECT, PROJECT PRIMARY AND SECONDARY *PURPOSES*, PROJECT *NEED*, INTENDED USE(S), AND ALTERNATIVES CONSIDERED (Attach additional sheets if necessary)

- The purpose and need must include any new development or expansion of an existing land use and/or proposed future use of residual land.
- Describe the physical alteration of surface waters, including the use of pilings (#, materials), vibratory hammers, explosives, and hydraulic dredging, when applicable, and *whether or not tree clearing will occur* (include the area in square feet and time of year).
- Include a description of alternatives considered and measures taken to avoid or minimize impacts to surface waters, including wetlands, to the maximum extent practicable. Include factors such as, but not limited to, alternative construction technologies, alternative project layout and design, alternative locations, local land use regulations, and existing infrastructure
- For utility crossings, include both alternative routes and alternative construction methodologies considered
- For surface water withdrawals, public surface water supply withdrawals, or projects that will alter in stream flows, include the water supply issues that form the basis of the proposed project.

The Northern Virginia Electric Cooperative (NOVEC) is proposing to build the Wildwood Substation in Loudoun County, Virginia. The site is situated northeast of Sycolin Road (Route 643), immediately south of the Dulles Greenway (Route 267), west of Belmont Ridge Road (Route 659), and can be accessed via Sycolin Road (see Appendix B, Figures 1 & 2) near the Town of Leesburg. The project is located in the Middle Potomac-Catoctin watershed within the Hydrologic Unit Code (HUC) 02070008. The purpose of an electrical distribution substation is to provide the capacity needed to meet the demand spurred by commercial and residential growth within a service area. The substation will ultimately be equipped with four 100 megavolt amperes (MVA) power transformers controlling fourteen to twenty distribution circuits. Four alternatives were assessed before the preferred alternative was finalized. Impacts have been reduced to below 1 acre and the preferred alternative results in impacts to a total of 0.38 ac of PFO wetlands, 0.23 ac PEM wetlands and 509 LF (0.03 ac) of intermittent streams.

Date of proposed commencement of work (MM/DD/YYYY)	Date of proposed completion of work (MM/DD/YYYY)
12/01/2020	12/01/2022
Are you submitting this application at the direction of any state, local, or federal agency? _____Yes __X__No	Has any work commenced or has any portion of the project for which you are seeking a permit been completed? _____ Yes __X__ No

If you answered "yes" to either question above, give details stating when the work was completed and/or when it commenced, who performed the work, and which agency (if any) directed you to submit this application. In addition, you will need to clearly differentiate between completed work and proposed work on your project drawings.

Are you aware of any unresolved violations of environmental law or litigation involving the property? _____Yes __X__No
(If yes, please explain)

4. PROJECT COSTS

Approximate cost of the entire project, including materials and labor: $ >1.5 million
Approximate cost of only the portion of the project affecting state waters (channelward of mean low water in tidal areas and below ordinary high water mark in nontidal areas): $ <500,000

5. PUBLIC NOTIFICATION (Attach additional sheets if necessary)

Complete information for all property owners adjacent to the project site and across the waterway, if the waterway is less than 500 feet in width. If your project is located within a cove, you will need to provide names and mailing addresses for all property owners within the cove. If you own the adjacent lot, provide the requested information for the first adjacent parcel beyond your property line.

Failure to provide this information may result in a delay in the processing of your application by VMRC.

Property owner's name	Mailing address	City	State	ZIP code
Available upon request				

Name of newspaper having general circulation in the area of the project: Loudoun Times-Mirror
Address and phone number (including area code) of newspaper 108 Church Street, SE 2nd Floor Leesburg, VA 20175 Phone: 703-777-1111

Have adjacent property owners been notified with forms in Appendix A? _____Yes __X__No (attach copies of distributed forms)

6. THREATENED AND ENDANGERED SPECIES INFORMATION

See Appendix F

Please provide any information concerning the potential for your project to impact state and/or federally threatened and endangered species (listed or proposed). Attach correspondence from agencies and/or reference materials that address potential impacts, such as database search results or confirmed waters and wetlands delineation/jurisdictional determination. Include information when applicable regarding the location of the project in Endangered Species Act-designated or -critical habitats. Contact information for the U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Virginia Dept. of Game and Inland Fisheries, and the Virginia Dept. of Conservation and Recreation-Division of Natural Heritage can be found on page 4 of this package.

7. HISTORIC RESOURCES INFORMATION

See Appendix G

Note: Historic properties include but are not limited to archeological sites, battlefields, Civil War earthworks, graveyards, buildings, bridges, canals, etc. Prospective permittees should be aware that section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the USACE from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the USACE, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.

Are any historic properties located within or adjacent to the project site? ____ Yes __X__ No _____ Uncertain
If Yes, please provide a map showing the location of the historic property within or adjacent to the project site.

Are there any buildings or structures 50 years old or older located on the project site? ____ Yes __X__ No _____ Uncertain
If Yes, please provide a map showing the location of these buildings or structures on the project site.

Is your project located within a historic district? ____ Yes __X__ No ____ Uncertain

If Yes, please indicate which district: _____

7. HISTORIC RESOURCES INFORMATION (Continued)

Has a survey to locate archeological sites and/or historic structures been carried out on the property?
_X_ Yes ___ No ___ Uncertain

If Yes, please provide the following information: Date of Survey: March 8, 2019

Name of firm: Stantec Consulting Services Inc.

Is there a report on file with the Virginia Department of Historic Resources? X Yes ____ No ___Uncertain

Title of Cultural Resources Management (CRM) report: Phase I Archaeological Survey of Approximately 27.59 Acres Associated with the Proposed Wildwood Substation, Loudoun County, Virginia

Was any historic property located? ____ Yes X No __ Uncertain

8. WETLANDS, WATERS, AND DUNES/BEACHES IMPACT INFORMATION

Report each impact site in a separate column. If needed, attach additional sheets using a similar table format. Please ensure that the associated project drawings clearly depict the location and footprint of each numbered impact site. For dredging, mining, and excavating projects, use Section 17.

	Impact site number PG1	Impact site number PG2	Impact site number PG3	Impact site number PG4	Impact site number PG5
Impact description (use all that apply): F=fill EX=excavation S=Structure T=tidal NT=non-tidal TE=temporary PE=permanent PR=perennial IN=intermittent SB=subaqueous bottom DB=dune/beach IS=hydrologically isolated V=vegetated NV=non-vegetated MC=Mechanized Clearing of PFO (*Example: F, NT, PE, V)*	F, NT, PE, V	F, NT, PE, V, MC	F, NT, PE, IN, V, MC	F, NT, PE, IN, V, MC	F, NT, PE, IN, V, MC
Latitude / Longitude (in decimal degrees)	39.047536, -77.541568	39.047436, -77.540652	39.047177, -77.539669	39.046610, -77.539121	39.045128, -77.542839
Wetland/waters impact area (square feet / acres)	162 sq. ft.	7,562 sq. ft.	420 sq. ft.	2,669 sq. ft.	6,807 sq. ft
Dune/beach impact area (square feet)	N/A	N/A	N/A	N/A	N/A
Stream dimensions at impact site (length and average width in linear feet, and area in square feet)	N/A	N/A	77 x 4.25= 327 sq.ft.	238 x 3.89 = 925 sq.ft.	194 x 5.99 =1,162 sq.ft.
Volume of fill below Mean High Water or Ordinary High Water (cubic yards)	N/A	N/A	6 cy	17 cy	22 cy

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8. WETLANDS/WATERS IMPACT INFORMATION (Continued)					
Cowardin classification of impacted wetland/water or geomorphological classification of stream *Example wetland: PFO; Example stream: 'C' channel and if tidal, whether vegetated or non-vegetated wetlands per Section 28.2-1300 of the Code of Virginia*	PEM	PFO	R4/PFO	R4/PFO	PFO
Average stream flow at site (flow rate under normal rainfall conditions in cubic feet per second) and method of deriving it (gage, estimate, etc.)	N/A	N/A	<1 cfs	<1 cfs	N/A
Contributing drainage area in acres or square miles (*VMRC cannot complete review without this information*)	N/A	N/A	<14 ac	~ 28 ac	N/A
DEQ classification of impacted resource(s): Estuarine Class II Non-tidal waters Class III Mountainous zone waters Class IV Stockable trout waters Class V Natural trout waters Class VI Wetlands Class VII http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9	Wetlands Class VII	Wetlands Class VII	Non-tidal waters Class III / Wetlands Class VII	Non-tidal waters Class III / Wetlands Class VII	Wetlands Class VII
For DEQ permitting purposes, also submit as part of this section a wetland and waters boundary delineation map – see (3) in the Footnotes section in the form instructions.					
For DEQ permitting purposes, also submit as part of this section a written disclosure of all wetlands, open water, or streams that are located within the proposed project or compensation areas that are also under a deed restriction, conservation easement, restrictive covenant, or other land-use protective instrument.					

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS

READ ALL OF THE FOLLOWING CAREFULLY BEFORE SIGNING

PRIVACY ACT STATEMENT: The Department of the Army permit program is authorized by Section 10 of the Rivers and Harbors Act of 1899, Section 404 of the Clean Water Act, and Section 103 of the Marine Protection Research and Sanctuaries Act of 1972. These laws require that individuals obtain permits that authorize structures and work in or affecting navigable waters of the United States, the discharge of dredged or fill material into waters of the United States, and the transportation of dredged material for the purpose of dumping it into ocean waters prior to undertaking the activity. Information provided in the Joint Permit Application will be used in the permit review process and is a matter of public record once the application is filed. Disclosure of the requested information is voluntary, but it may not be possible to evaluate the permit application or to issue a permit if the information requested is not provided.

CERTIFICATION: I am hereby applying for permits typically issued by the DEQ, VMRC, USACE, and/or Local Wetlands Boards for the activities I have described herein. I agree to allow the duly authorized representatives of any regulatory or advisory agency to enter upon the premises of the project site at reasonable times to inspect and photograph site conditions, both in reviewing a proposal to issue a permit and after permit issuance to determine compliance with the permit.

In addition, I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

8. WETLANDS, WATERS, AND DUNES/BEACHES IMPACT INFORMATION					
	Impact site Number PR1	Impact site Number PR2	Impact site Number PR3	Impact site Number	Impact site Number
Impact Description (use all that apply) F= Fill EX= excavation S= structure T=tidal NT= non-tidal TE= temporary PE= permanent PR= perennial IN= intermittent SB= subaqueous bottom DB= dune/beach IS= hydrologically isolated V=vegetated NV= non-vegetated MC= mechanized clearing of PFO	F, NT, PE, V	F, NT, PE, V	F, NT, PE, IT, V		
Latitude / Longitude (in decimal degrees)	39.045025, -77.542795	39.046163, -77.542444	39.046163, -77.542444		
Wetland/waters impacts area (square feet)	7,269 sf	2,815 sf	1,585 sf		
Dune/Beach impact area (square feet)	N/A	N/A	N/A		
Stream dimensions at impact site (length and average width in linear feet, and in area sq. ft.)	N/A	N/A	194 x 6 = 1,162 sf		
Volume of fill below Mean High Water or Ordinary High Water (cubic yards)	N/A	N/A	N/A		
Cowardin classification of impacted wetland/water of geomorphological classification of stream	PFO, PEM	PEM	R3, PFO		
Average stream flow at site (flow rate under normal rainfall conditions) (cubic feet per second) - Stream stats	N/A	N/A	< 1 cfs		
Contributing drainage area (acres or square miles)	N/A	N/A	~33 ac		
DEQ classification of impacted resource(s): Estuarine Class I Non-tidal waters Class lll Mountainous zone water Class IV Stockable trout waters Class V Natural trout waters Class VI Wetlands Class VII	Wetlands Class VII	Wetlands Class VII	Non-tidal waters Class III; Wetlands Class VII		

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9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS (Continued)

Is/Are the Applicant(s) and Owner(s) the same? ☑ *Yes* ☐ *No*

Legal name & title of Applicant Mr. Robert E. Bisson, Vice President	Second applicant's legal name & title, if applicable
Applicant's signature	Second applicant's signature
Date	Date
Property owner's legal name, if different from Applicant	Second property owner's legal name, if applicable
Property owner's signature, if different from Applicant	Second property owner's signature
Date	Date

CERTIFICATION OF AUTHORIZATION TO ALLOW AGENT(S) TO ACT ON APPLICANT'S(S') BEHALF (IF APPLICABLE)

I (we), Northern Virginia Electric Co-op (and) _____ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

hereby certify that I (we) have authorized Stantec Consulting Services Inc. (and) _____
AGENT'S NAME(S) – *complete the second blank if more than one Agent*

to act on my (our) behalf and take all actions necessary to the processing, issuance, and acceptance of this permit and any and all standard and special conditions attached. I (we) hereby certify that the information submitted in this application is true and accurate to the best of my (our) knowledge.

Applicant's signature	Second applicant's signature, if applicable
Date	Date
Agent's signature and title	Second agent's signature and title, if applicable
Date	Date

CONTRACTOR ACKNOWLEDGEMENT (IF APPLICABLE)

I (we), _____ (and) _____ ,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

have contracted _____ (and) _____
CONTRACTOR'S NAME(S) – *complete the second blank if more than one Contractor*

to perform the work described in this Joint Permit Application, signed and dated _____.

I (we) will read and abide by all conditions as set forth in all federal, state, and local permits as required for this project. I (we) understand that failure to follow the conditions of the permits may constitute a violation of applicable federal, state, and local statutes and that we will be liable for any civil and/or criminal penalties imposed by these statutes.
In addition, I (we) agree to make available a copy of any permit to any regulatory representative visiting the project site to ensure permit compliance. If I (we) fail to provide the applicable permit upon request, I (we) understand that the representative will have the option of stopping our operation until it has been determined that we have a properly signed and executed permit and are in full compliance with all of the terms and conditions.

Contractor's name or name of firm (printed/typed)	Contractor's or firm's mailing address	
Contractor's signature and title	Contractor's license number	Date
Applicant's signature	Second applicant's signature, if applicable	
Date	Date	

9. APPLICANT, AGENT, PROPERTY OWNER, AND CONTRACTOR CERTIFICATIONS (Continued)

Is/Are the Applicant(s) and Owner(s) the same? ☑ *Yes* ☐ *No*

Legal name & title of Applicant	Second applicant's legal name & title, if applicable
Mr. Robert E. Bisson, Vice President	
Applicant's signature: Robert E Bisson	Second applicant's signature
Date: 2/1/21	Date
Property owner's legal name, if different from Applicant	Second property owner's legal name, if applicable
Property owner's signature, if different from Applicant	Second property owner's signature
Date	Date

CERTIFICATION OF AUTHORIZATION TO ALLOW AGENT(S) TO ACT ON APPLICANT'S(S') BEHALF (IF APPLICABLE)

I (we), Northern Virginia Electric Co-op (and) _____,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

hereby certify that I (we) have authorized Stantec Consulting Services Inc. (and) _____
AGENT'S NAME(S) – *complete the second blank if more than one Agent*

to act on my (our) behalf and take all actions necessary to the processing, issuance, and acceptance of this permit and any and all standard and special conditions attached. I (we) hereby certify that the information submitted in this application is true and accurate to the best of my (our) knowledge.

Applicant's signature: Robert E Bisson	Second applicant's signature, if applicable
Date: 2/1/21	Date
Agent's signature and title: Regulatory Specialist Andrea Porter	Second agent's signature and title, if applicable
Date: 2/1/2021	Date

CONTRACTOR ACKNOWLEDGEMENT (IF APPLICABLE)

I (we), _____ (and) _____,
APPLICANT'S LEGAL NAME(S) – *complete the second blank if more than one Applicant*

have contracted _____ (and) _____
CONTRACTOR'S NAME(S) – *complete the second blank if more than one Contractor*

to perform the work described in this Joint Permit Application, signed and dated _____.

I (we) will read and abide by all conditions as set forth in all federal, state, and local permits as required for this project. I (we) understand that failure to follow the conditions of the permits may constitute a violation of applicable federal, state, and local statutes and that we will be liable for any civil and/or criminal penalties imposed by these statutes.
In addition, I (we) agree to make available a copy of any permit to any regulatory representative visiting the project site to ensure permit compliance. If I (we) fail to provide the applicable permit upon request, I (we) understand that the representative will have the option of stopping our operation until it has been determined that we have a properly signed and executed permit and are in full compliance with all of the terms and conditions.

Contractor's name or name of firm (printed/typed)	Contractor's or firm's mailing address	
Contractor's signature and title	Contractor's license number	Date
Applicant's signature	Second applicant's signature, if applicable	
Date	Date	

17. DREDGING, MINING, AND EXCAVATING (Continued)

For mining projects: On separate sheets of paper, explain the operation plans, including: 1) the frequency (e.g., every six weeks), duration (i.e., April through September), and volume (in cubic yards) to be removed per operation; 2) the temporary storage and handling methods of mined material, including the dimensions of the containment berm used for upland disposal of dredged material and the need (or no need) for a liner or impermeable material to prevent the leaching of any identified contaminants into ground water; 3) how equipment will access the mine site; and 4) verification that dredging: a) will not occur in water body segments that are currently on the effective Section 303(d) Total Maximum Daily Load (TMDL) priority list (available at http://www.deq.virginia.gov/Programs/Water/WaterQualityInformationTMDLs/TMDL/TMDLDevelopment/TMDLProgramPriorities.aspx) or that have an approved TMDL; b) will not exacerbate any impairment; and c) will be consistent with any waste load allocation/limit/conditions imposed by an approved TMDL (see, "What's in my backyard" or subsequent spatial files at http://www.deq.virginia.gov/ConnectWithDEQ/VEGIS.aspx to determine the extent of TMDL watersheds and impairment segments).

Have you applied for a permit from the Virginia Department of Mines, Minerals and Energy? _____Yes _____No If Yes:
Existing permit number: _____ Date permit issued: _____

Contributing drainage area: _____square miles	Average stream flow at site (flow rate under normal rainfall conditions): _____cfs

18. FILL (not associated with backfilled shoreline structures) AND OTHER STRUCTURES (other than piers and boathouses) IN WETLANDS OR WATERS, OR ON DUNES/BEACHES

Source and composition of fill material (percentage sand, silt, clay, rock):

Existing onsite material is anticipated to be used for fill.

Provide documentation (i.e., laboratory results or analytical reports) that *fill* material from *off-site* locations is free of toxics. If not free of toxics, provide documentation of proper disposal (i.e., bill of lading from commercial supplier or disposal site). Documentation is not necessary for fill material obtained from on-site areas.

Explain the purpose of the filling activity and the type of structure to be constructed over the filled area (if any):

Fill is necessary in order to construct a pad site to support electrical equipment associated with the substation operations.

Describe any structure that will be placed in wetlands/waters or on a beach dune and its purpose:

N/A

Will the structure be placed on pilings? N/A Yes ____ No	Total area occupied by any structure. N/A Square Feet
How far will the structure be placed channelward from the back edge of the dune? N/A feet	How far will the structure be placed channelward from the back edge of the beach? N/A feet

19. NONTIDAL STREAM CHANNEL MODIFICATIONS FOR RESTORATION OR ENHANCMENT, or TEMPORARY OR PERMANENT RELOCATIONS

If proposed activities are being conducted for the purposes of compensatory mitigation, please attach separate sheets of paper providing all information required by the most recent version of the stream assessment methodology approved by the Norfolk District of the U.S. Army Corps of Engineers and the Virginia Department of Environmental Quality, in lieu of completing the questions below. Required information outlined by the methodology can be found at:
http://www.nao.usace.army.mil/Missions/Regulatory/UnifiedStreamMethodology.aspx *or*
http://www.deq.virginia.gov/Programs/Water/WetlandsStreams/Mitigation.aspx.

For all projects proposing stream restoration provide a completed Natural Channel Design Review Checklist and Selected Morphological Characteristics form. These forms and the associated manual can be located at:
https://www.fws.gov/chesapeakebay/StreamReports/NCD%20Review%20Checklist/Natural%20Channel%20Design%20Checklist%20Doc%20V2%20Final%2011-4-11.pdf

Has the stream restoration project been designed by a local, state, or federal agency? ____ Yes ____ No. If yes, please include the name of the agency here: _____.

Is the agency also providing funding for this project? _____ Yes _____ No

Stream dimensions at impact site (length and average width in linear feet, and area in square feet):
L: _____(feet) AW:_____ (feet) Area:_____ (square feet)

Contributing drainage area: _____acres *or* _____square miles

20. UTILITY CROSSINGS (Continued)

Will there be an excess of excavated material? _____Yes _____No
If so, describe the method that will be undertaken to dispose of, and transport, the material to its permanent disposal location and give that location:

Will any excess material be stockpiled in wetlands? _____Yes _____No
If so, will the stockpiled material be placed on filter fabric or some other type of impervious surface? _____Yes _____No

Will permanent access roads be placed through wetlands/streams? ____Yes _____No
If yes, will the roads be (check one) ☐ at grade ☐ above grade?

Will the utility line through wetlands/waters be continually maintained (e.g. via mowing or herbicide)? ____Yes _____No
If maintained, what is the maximum width? _____feet

21. ROAD CROSSINGS

Have you conducted hydraulic studies to verify the adequacy of the culverts? _X_Yes _____No See Appendix C for SWM information.
If so, please attach a copy of the hydraulic study/report.
Virginia Department of Transportation (VDOT) standards require that the backwater for a 100 year storm not exceed 1 foot for all road, culvert, and bridge projects within FEMA-designated floodplains. Virginia Department of Environmental Quality (DEQ) requires pipes and culverts 24 inches or less in diameter to be countersunk three inches below the natural stream bed elevations, and pipes and culverts greater than 24 inches to be countersunk at least six inches below the natural stream bed elevations. Hydraulic capacity is determined based on the reduced capacity due to the countersunk position.

Will the culverts be countersunk below the stream bottom? _X_Yes _____No. If no, explain:

Culvert will be countersunk at stream crossing.

If the project entails a bridged crossing and there are similar crossings in the area, what is the vertical distance above mean high water, mean low water, or ordinary high water mark of those similar structures? _N/A_____feet above _____
For all bridges proposed over navigable waterways (including all tidal water bodies), you will be required to contact the U.S. Coast Guard to determine if a permit is required of their agency.

On separate sheets of paper, describe the materials to be used, the method of construction (including the use of cofferdams), the sequence of construction events, and if bedrock conditions may be encountered. Include cross-sections and profile plans of the culvert crossings including wing walls or rip rap.

22. IMPOUNDMENTS, DAMS, AND STORMWATER MANAGEMENT FACILITIES
If the impoundment or dam is a component of a water withdrawal project, also complete Sections 24 through 26.

Will the proposed impoundment, dam, or stormwater management facility be used for agricultural purposes (e.g., in the operation of a farm)? For DEQ permitting purposes, a farm is considered to be a property or operation that produces goods for market.
___ Yes ___ No

What type of materials will be used in the construction (earth, concrete, rock, etc.)? _____

What is the source of these materials? _____

Provide the dimensions of proposed impoundment, dam, or stormwater management facility, including the height and width of all structures.

Storage capacity* of impoundment: _____acre-feet *should be given for the normal pool of recreational or farm ponds, or design pool for stormwater management ponds or reservoirs (the elevation the pond will be at for the design storm, e.g., 10-year, 24-hour storm)	Surface area** of impoundment: _____acres **should be given for the normal pool of recreational or farm ponds, or design pool for stormwater management ponds or reservoirs (the elevation the pond will be at for the design storm, e.g., 10-year, 24-hour storm)

APPENDIX C

Chesapeake Bay Preservation Act Information

Please answer the following questions to determine if your project is subject to the requirements of the Bay Act Regulations:

1. Is your project located within Tidewater Virginia? ____Yes __X__No (See map on page 31) - If the answer is "no", the Bay Act requirements do not apply; if "yes", then please continue to question #2.

2. Please indicate if the project proposes to impact any of the following Resource Protection Area (RPA) features:

   ____ Tidal wetlands,

   ____ Nontidal wetlands connected by surface flow and contiguous to tidal wetlands or water bodies with perennial flow,

   ____ Tidal shores,

   ____ Other lands considered by the local government to meet the provisions of subsection A of 9VAC25-830-80 and to be necessary to protect the quality of state waters (contact the local government for specific information),

   ____ A buffer area not less than 100 feet in width located adjacent to and landward of the components listed above, and along both sides of any water body with perennial flow.

If the answer to question #1 was "yes" and any of the features listed under question #2 will be impacted, compliance with the Chesapeake Bay Preservation Area Designation and Management Regulations is required. **The Chesapeake Bay Preservation Area Designation and Management Regulations** are enforced through locally adopted ordinances based on the Chesapeake Bay Preservation Act (CBPA) program. Compliance with state and local CBPA requirements mandates the submission of a ***Water Quality Impact Assessment (WQIA)*** for the review and approval of the local government. Contact the appropriate local government office to determine if a WQIA is required for the proposed activity(ies).

The individual localities, not the DEQ, USACE, or the Local Wetlands Boards, are responsible for enforcing the CBPA requirements and, therefore, local permits for land disturbance are not issued through this JPA process. **Approval of this wetlands permit does not constitute compliance with the CBPA regulations nor does it guarantee that the local government will grant approval for encroachments into the RPA that may result from this project.**

Notes for all projects in RPAs

Development, redevelopment, construction, land disturbance, or placement of fill within the RPA features listed above requires the approval of the locality and may require an exception or variance from the local Bay Act ordinance. Please contact the appropriate local government to determine the types of development or land uses that are permitted within RPAs.

Pursuant to 9VAC25-830-110, *on-site delineation of the RPA is required for all projects in CBPAs*. Because USGS maps are not always indicative of actual "in-field" conditions, they may not be used to determine the site-specific boundaries of the RPA.

Notes for shoreline erosion control projects in RPAs

Re-establishment of woody vegetation in the buffer will be required by the locality to mitigate for the removal or disturbance of buffer vegetation associated with your proposed project. Please contact the local government to determine the mitigation requirements for impacts to the 100-foot RPA buffer.

Pursuant to 9VAC25-830-140 5 a (4) of the Virginia Administrative Code, shoreline erosion projects are a permitted modification to RPAs provided that the project is based on the "best technical advice" and complies with applicable permit conditions. In accordance with 9VAC25-830-140 1 of the Virginia Administrative Code, the locality will use the information provided in this Appendix, in the project drawings, in this permit application, and as required by the locality, to make a determination that:

1. Any proposed shoreline erosion control measure is necessary and consistent with the nature of the erosion occurring on the site, and the measures have employed the "best available technical advice"
2. Indigenous vegetation will be preserved to the maximum extent practicable
3. Proposed land disturbance has been minimized
4. Appropriate mitigation plantings will provide the required water quality functions of the buffer (9VAC25-830-140 3)
5. The project is consistent with the locality's comprehensive plan
6. Access to the project will be provided with the minimum disturbance necessary.

PROJECT NAME
17-SPGP-01 COMPLETE APPLICATION CHECKLIST

	Submission Requirements	Material Location
1	Completed and signed JPA with SPGP box checked	Page 7 and Page 13
2	Any existing Corps project numbers and previous actions	N/A
3	The applicant's name, contact person, mailing address, telephone number, email address	JPA Section 1
4	The authorized agent's name, contact person, mailing address, telephone number, email address	JPA Section 1
5	Project location information: address, city/county	JPA Section 2
6	Water body or water bodies or receiving stream, as applicable	JPA Section 2
7	Latitude and longitude (to the nearest second) from a central location within the project limits	JPA Section 2
8	The hydrologic unit code (HUC) for the project area	JPA Section 2
9	The name of the project, narrative description of project purpose, and a description of the proposed activities in waters, including wetlands	JPA Section 3
10	Wetlands/Waters Impacts	JPA Section 8
11	All appropriate sections from the JPA, including signature pages: (a) Include Sections 1-9, and applicable Sections 10-27 for all General Permits (b) Check that all applicable requirements within individual sections (i.e. Appendices) of the JPA have been followed, such as road and utility crossing narratives	1-9 Completed 18 and 21 completed.
12	A detailed location map (e.g., a United States Geologic Survey topographic quadrangle map, ADC road map) of the project area, including the project boundary. The map should be of sufficient detail such that the site may be easily located for site inspection	Appendix B, Figures 1 and 2
13	Project plan view. All plan view sketches should include, at a minimum, north arrow, scale, existing structures, existing contours, proposed contours (if available), limit of waters, including wetlands, direction of flow, ordinary high water line, impact limits, and location and dimension of all proposed structures in impact areas. In addition, cross-sectional or profile sketches with the above information may be required to detail impact areas and those impacts associated with the installation of structures.	Appendix B, Figure 3
14	Check that all informational requirements for drawings, listed in Appendix D of the JPA, have been followed	Done
15	Large-sized impact map (at a scale no smaller than 1" = 200'); use matchlines if the entire site cannot fit on one sheet at this scale and provide a cover page showing how all sheets relate.	Appendix B, Figures 3 through 14

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16	A description of the specific on-site measures considered and taken during project design and development both to avoid and minimize impacts to waters, including wetlands, to the maximum extent practicable. If applicable, submit alternative designs as well as an economic analysis	Report Section 2 and Appendix B Figures 3, 15, 16, 17 & 18
17	Endangered and threatened species information and related correspondence	Appendix G
18	Historic resources information and related correspondence, including a plan view depicting all historical resources located within the project boundaries.	Appendix H
19	A conceptual mitigation plan that adheres to the mitigation requirements and preference hierarch of the Corps-EPA Compensatory Mitigation for Losses of Aquatic Resources Rule dated April 10, 2008 (33 CFR 325 and 332; 40 CFR 230)	N/A
20	Applicants proposing compensation involving the purchase or use of mitigation banking or in-lieu fee credits shall include as their conceptual compensation plan: (a) The name of the proposed mitigation bank or in-lieu fee; (b) the HUC in which it is located; (c) the number of credit proposed to be purchases; (d) a letter of credit availability from the Sponsor (e) If applicable, a copy of the stream assessment report in the JPA	N/A
21	WETLANDS: Applicants proposing onsite/offsite permittee responsible mitigation shall include as their conceptual compensation plan (33 CFR 332.4(c)(2)-(14)) : (a) Objectives; (b) site selection; (c) site protection instruments; (d) baseline information; (e) credit determination methodology (f) mitigation work plan including water budget; (g) maintenance plan; (h) ecological performance standards; (i) monitoring requirements; (j) long-term management; (k) adaptive management plan; (l) financial assurances;	N/A

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22	WATERS: Applicants proposing onsite/offsite permittee responsible mitigation shall include as their conceptual compensation plan (33 CFR 332.4(c)(2)-(14)) : (a) Objectives; (b) site selection; (c) site protection instruments; (d) baseline information; (e) credit determination methodology (f) mitigation work plan including water budget; (g) maintenance plan; (h) ecological performance standards; (i) monitoring requirements; (j) long-term management; (k) adaptive management plan; (l) financial assurances; (m) planform geometry (n) channel form (o) watershed size (p) design discharge (q) riparian area plantings (r) a reference reach (s) completed Natural Channel Design Review Checklist (t) completed Selected Morphological Characteristics Form	N/A
23	A Corps confirmed delineation map that is approved for use with a permit application or confirmed jurisdictional determination map that includes the limits of all waters, including wetlands that are located within the project boundaries.	Appendix E
24	A written disclosure identifying all wetlands, open water, streams, and associated upland buffers within the proposed project or compensation areas that are under a deed restriction, conservation easement, restrictive covenant, or other land use protective instrument (protected areas). Such disclosure shall include the nature of the prohibited activities within the protected areas.	N/A

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APPENDIX B – GRAPHICS

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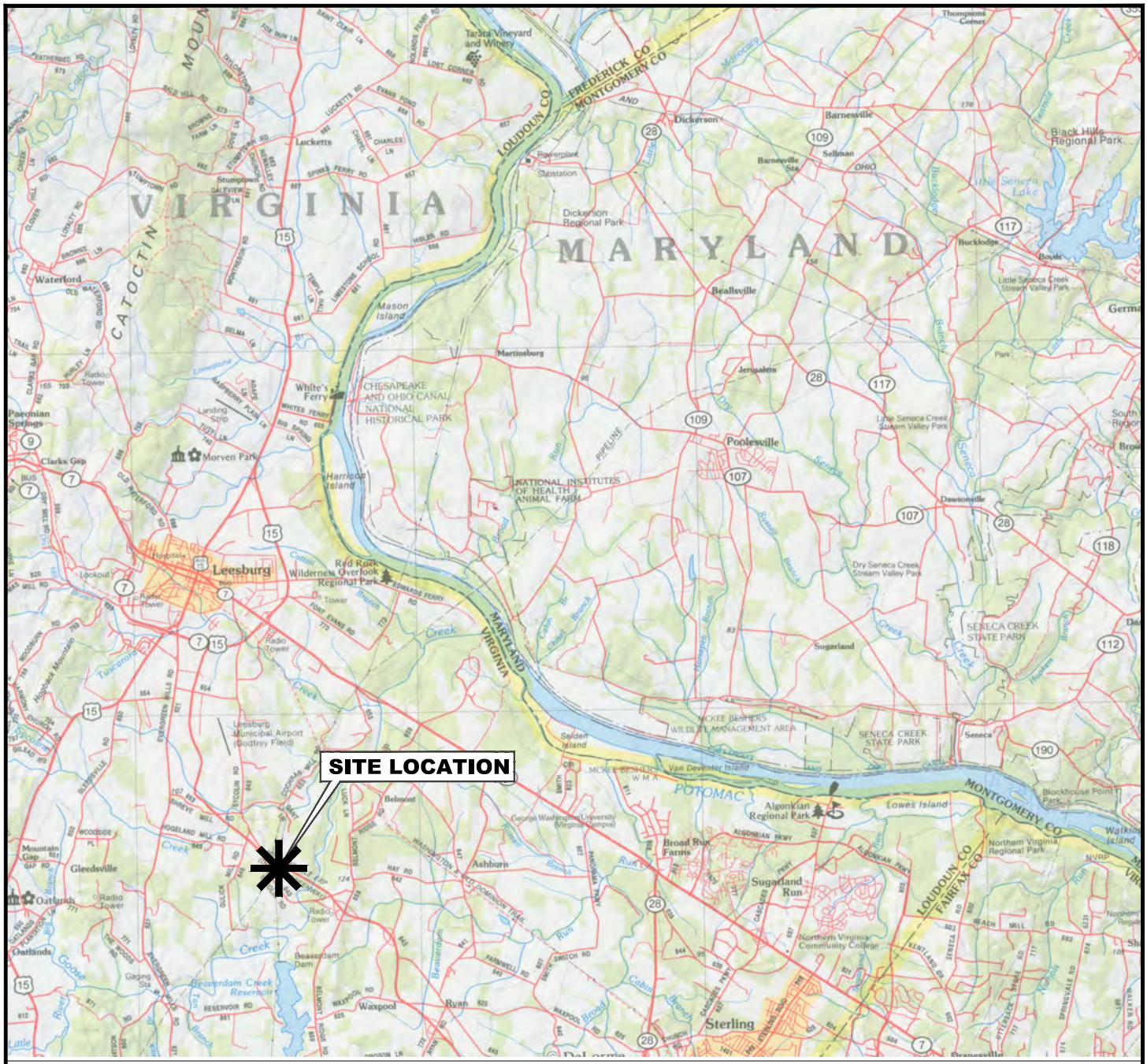

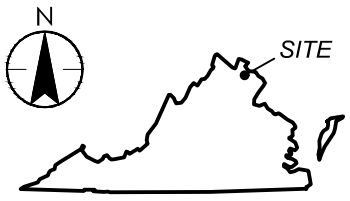

1.2 0 1.2 2.4 3.6 4.8 6 7.2 8.4

SCALE IN MILE

SOURCE: VA. ATLAS & GAZETEER & DELORME MAPPING CO., 1995.

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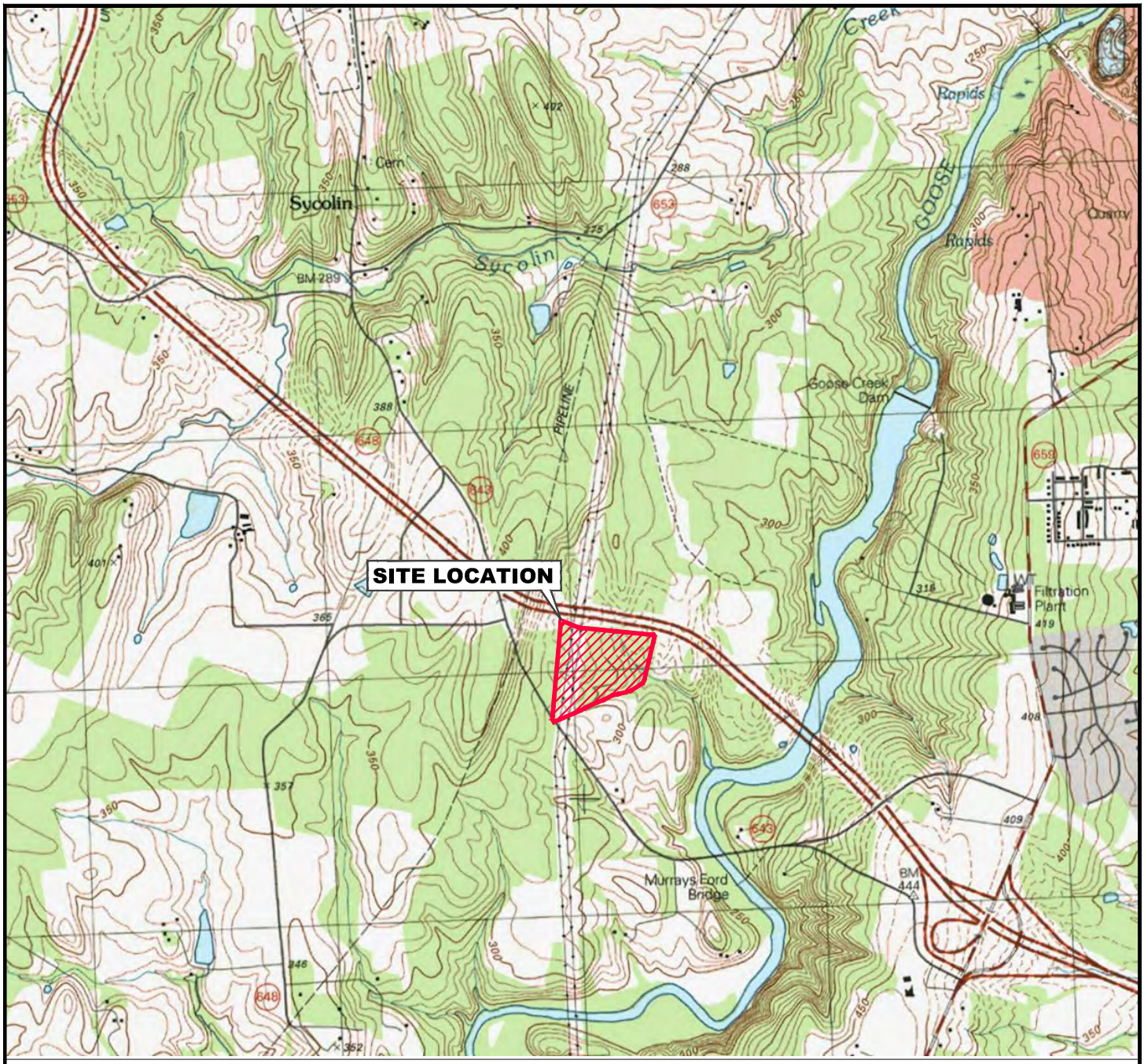
FOR:		SITE VICINITY MAP	FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA			1
JOB NUMBER: 203401129	DRAWN BY: RH	CHECKED BY: AF	APPROVED BY: LC	DATE: MAY 2018

FILEPATH:U:\203401129\03_data\gis_cad\cad\01129n_loc_vic.dwg|jmann|Feb 19, 2019 at 14:00|Layout: SITE VICINITY MAP



LATITUDE: 39.046780°
LONGITUDE: 77.540235°
SOURCE: USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP, LEESBURG, VA QUADRANGLE, 1994 .

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FOR:		SITE LOCATION MAP		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA				2
JOB NUMBER: 203401129	DRAWN BY: RH	CHECKED BY: AF	APPROVED BY: LC	DATE: MAY 2018

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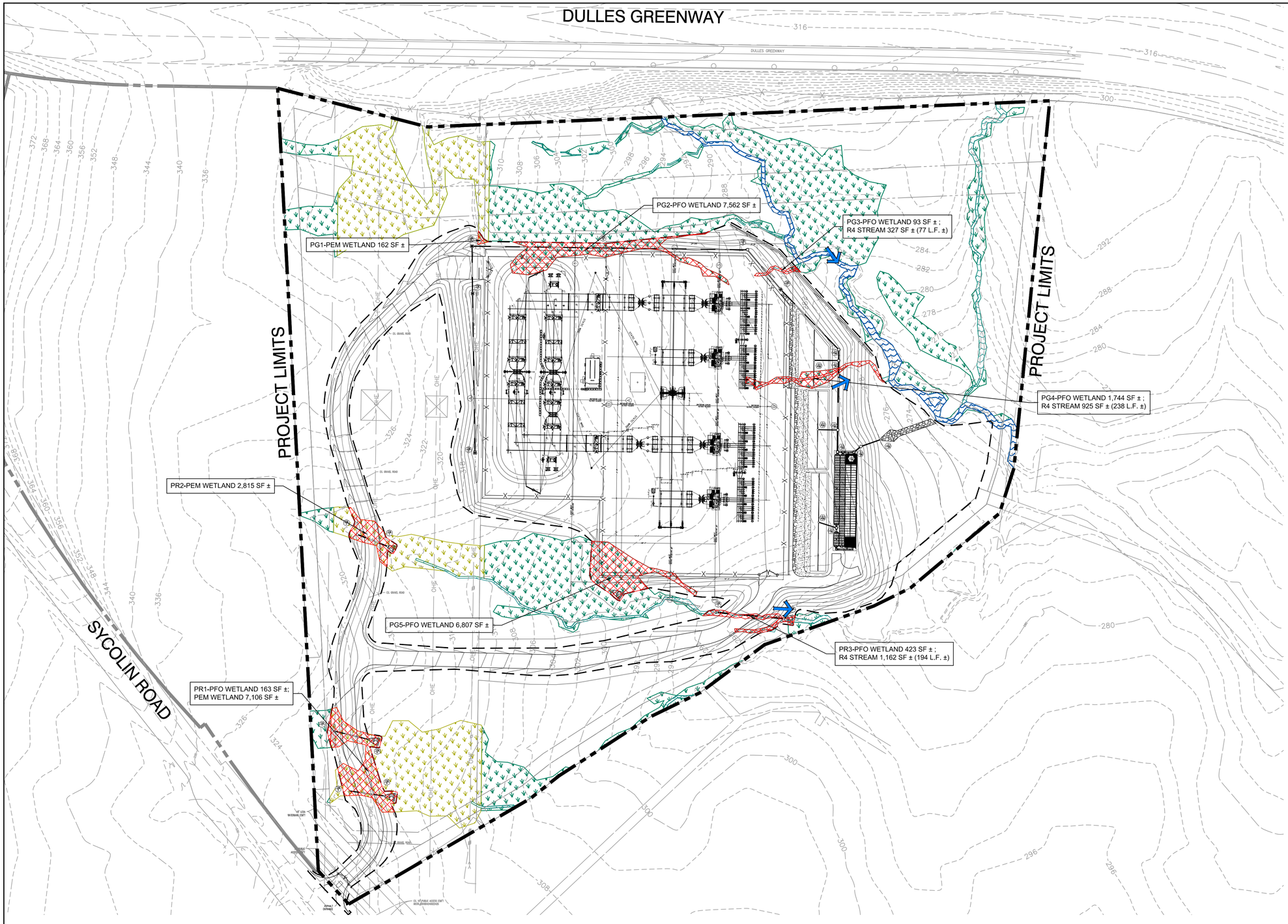

APPROXIMATE FORESTED WETLAND (PFO) LIMITS

APPROXIMATE EMERGENT WETLAND (PEM) LIMITS

APPROXIMATE PERENNIAL STREAM CHANNEL (R3) LIMITS

APPROXIMATE INTERMITTENT STREAM CHANNEL (R4) LIMITS

PROPOSED FORESTED WETLAND (PFO) IMPACTS

PROPOSED EMERGENT WETLAND (PEM) IMPACTS

PROPOSED INTERMITTENT STREAM CHANNEL (R4) IMPACTS LIMITS

DIRECTION OF FLOW

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)
PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

JURISDICTIONAL AREA IMPACTS:

PERMANENT IMPACTS

PFO WETLANDS	0.39 ACRES ±
PEM WETLANDS	0.23 ACRES ±
R4 STREAM CHANNELS	0.06 ACRES ±
(EXCLUDING WETLANDS)	(509 L.F.±)

PERMANENT IMPACTS TABLE

IMPACT	WETLANDS		STREAM CHANNELS	
	PFO	PEM	R4	
	SF	SF	SF	LF x W
PG1	-	162	-	-
PG2	7,562	-	-	-
PG3	93	-	327	77x4
PG4	1,744	-	925	238x4
PG5	6,807	-	-	-
PR1	163	7,106	-	-
PR2	-	2,815	-	-
PR3	423	-	1,162	194x6
TOTAL	16,792	10,083	2,414	509
ACRES	0.39	0.23	0.06	

LEVEL OF IMPACTS:
P = PERMANENT IMPACT
C = CONVERSION IMPACT
T = TEMPORARY IMPACT

TYPES OF IMPACTS:
G = GRADING IMPACT
R = ROAD IMPACT
U = UTILITY

N

0 80 160

GRAPHICAL SCALE (FEET)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

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FOR: NOVEC WILDWOOD SUBSTATION
LOUDOUN COUNTY, VIRGINIA

OVERALL IMPACTS MAP
PREFERRED ALTERNATIVE

FIGURE: 3

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
203401129	RC	AF	LC	SEPTEMBER 2020

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FOR:		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS	4

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
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FOR:		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS	5

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
203401129	RC	AF	LC	SEPTEMBER 2020

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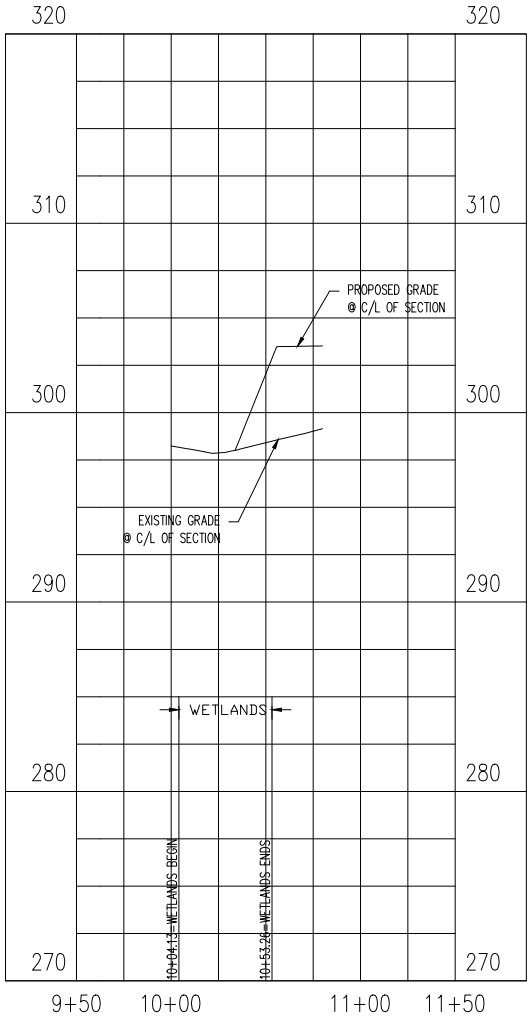

PG2

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FOR:		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS	6

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
203401129	RC	AF	LC	SEPTEMBER 2020

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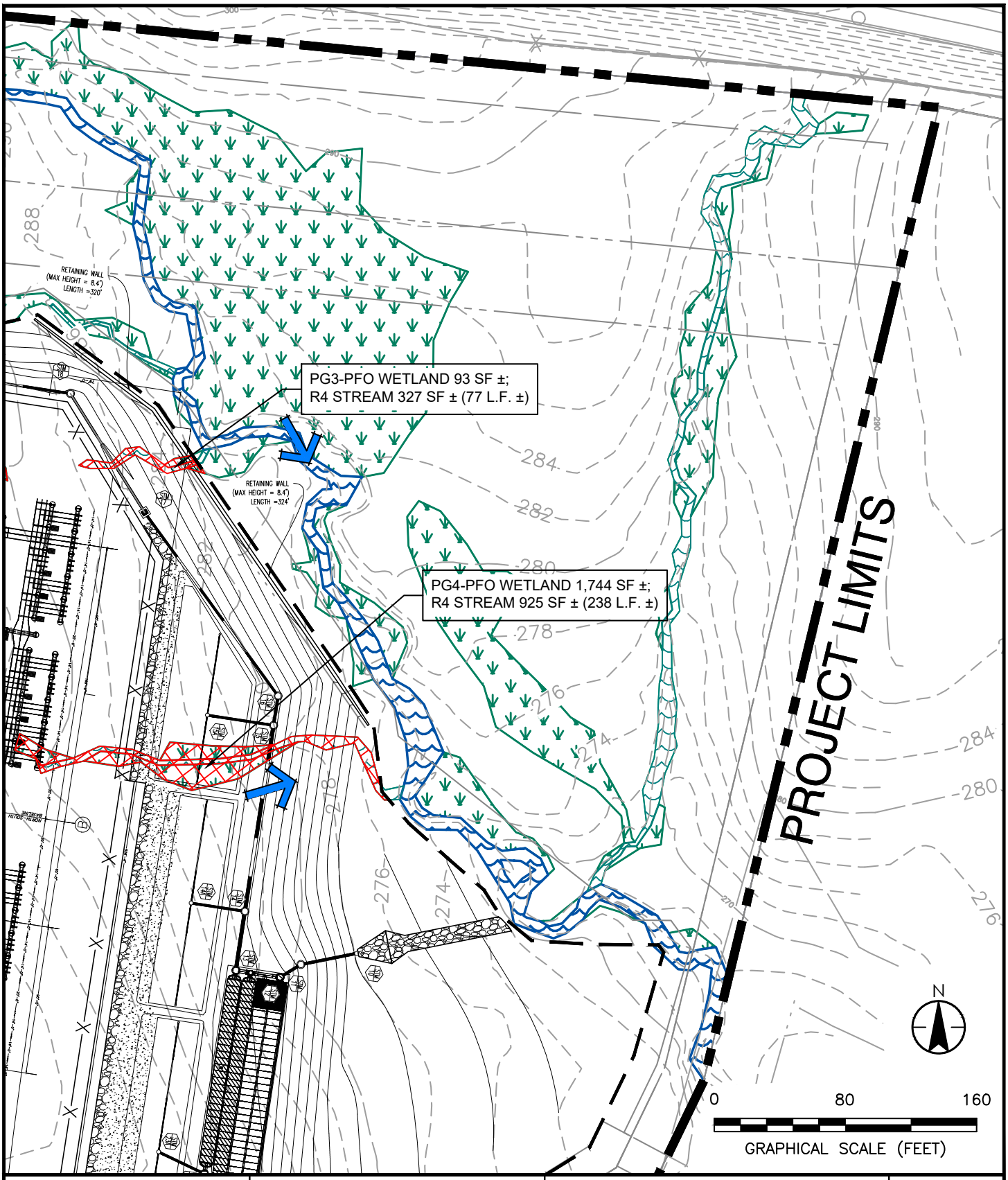

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FOR:		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS	7

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
203401129	RC	AF	LC	SEPTEMBER 2020

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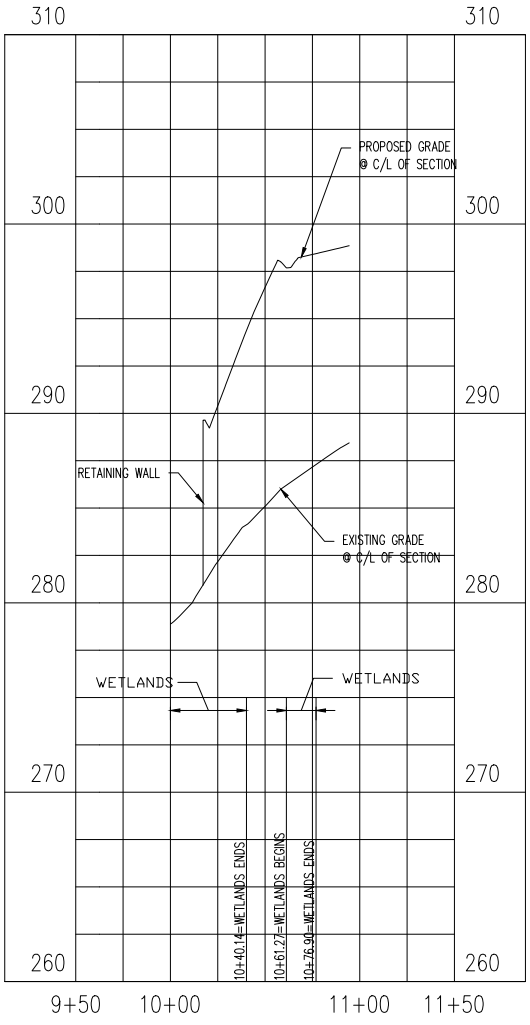
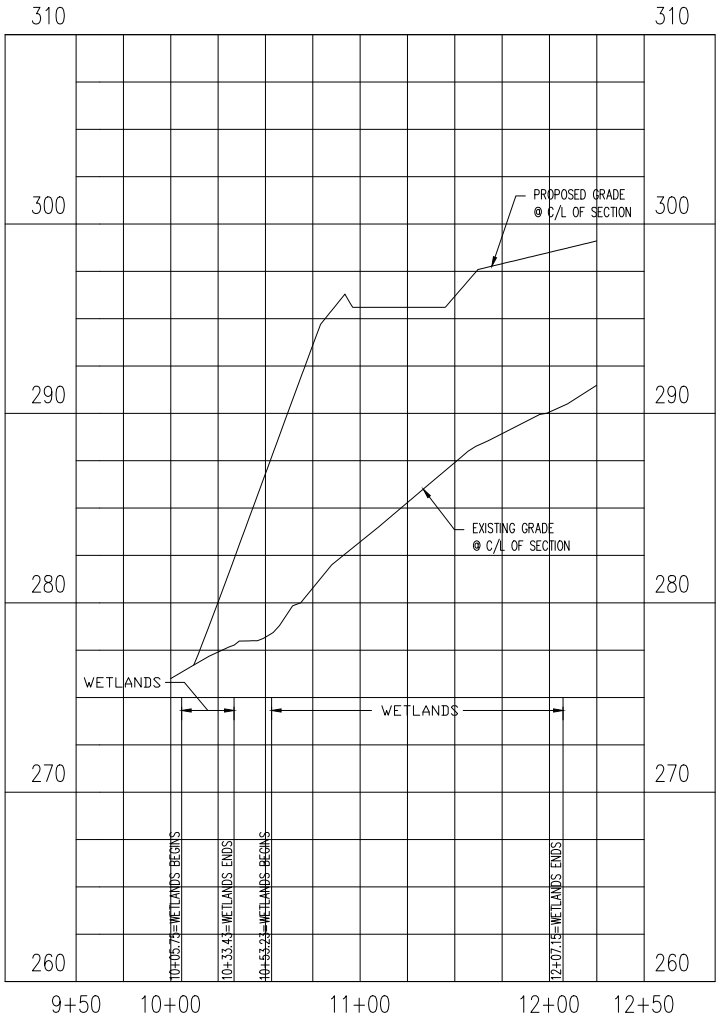


PG3



PG4

Stantec 150 Riverside Parkway, Suite 301 Fredericksburg, VA 22406 PHONE:(540) 785-5544 FAX:(540) 785-1742	FOR: NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS		FIGURE: 8
	JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

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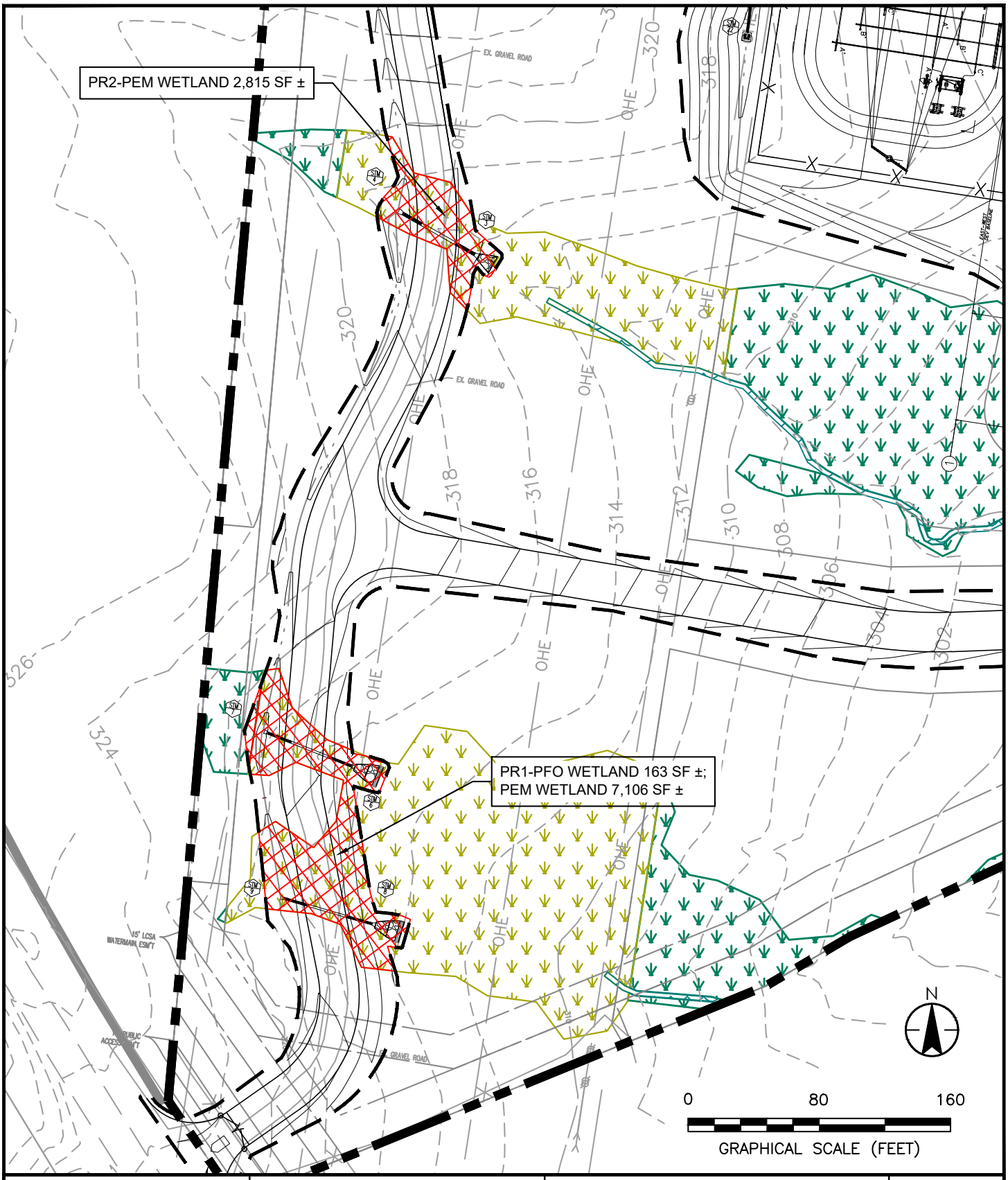

Stantec 150 Riverside Parkway, Suite 301 Fredericksburg, VA 22406 PHONE:(540) 785-5544 FAX:(540) 785-1742	FOR: NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS			FIGURE: 9
	JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

FILEPATH:T:\203401129\03_data\gis_cad\cad\01129n_imp_alt_20200831.dwg|racole|Sep 29, 2020 at 14:44|Layout: 9

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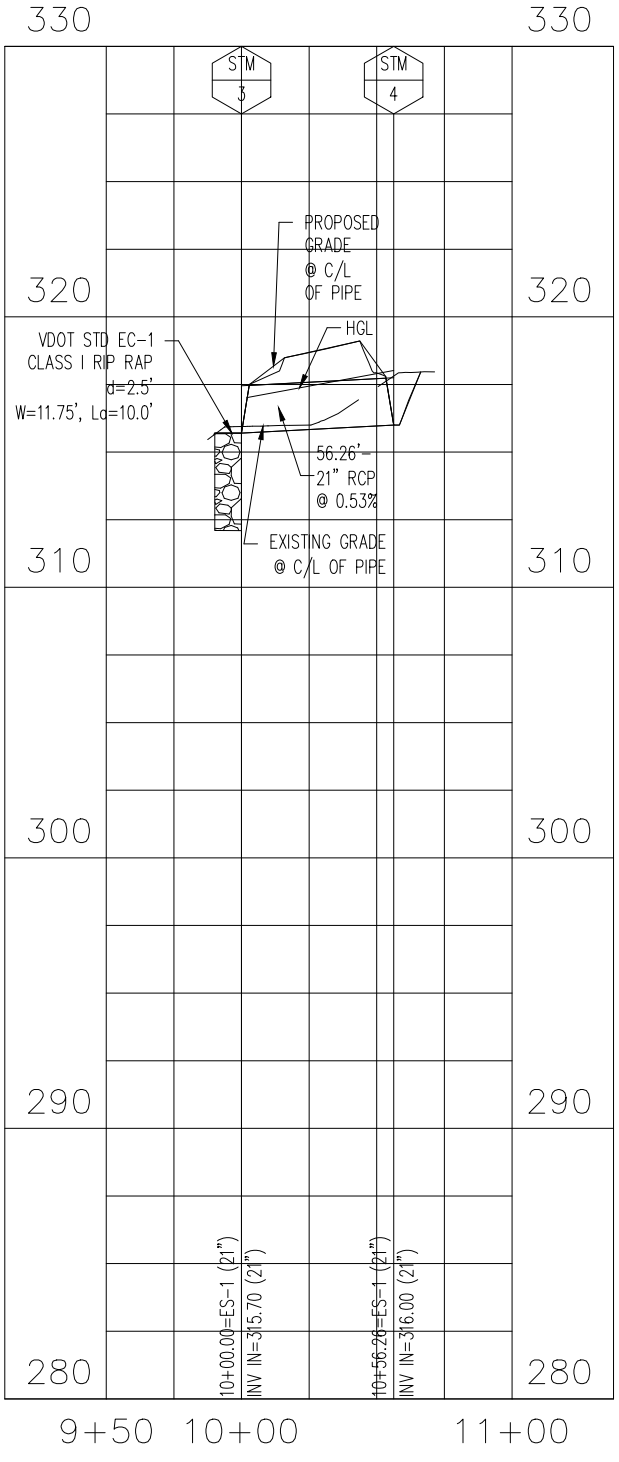
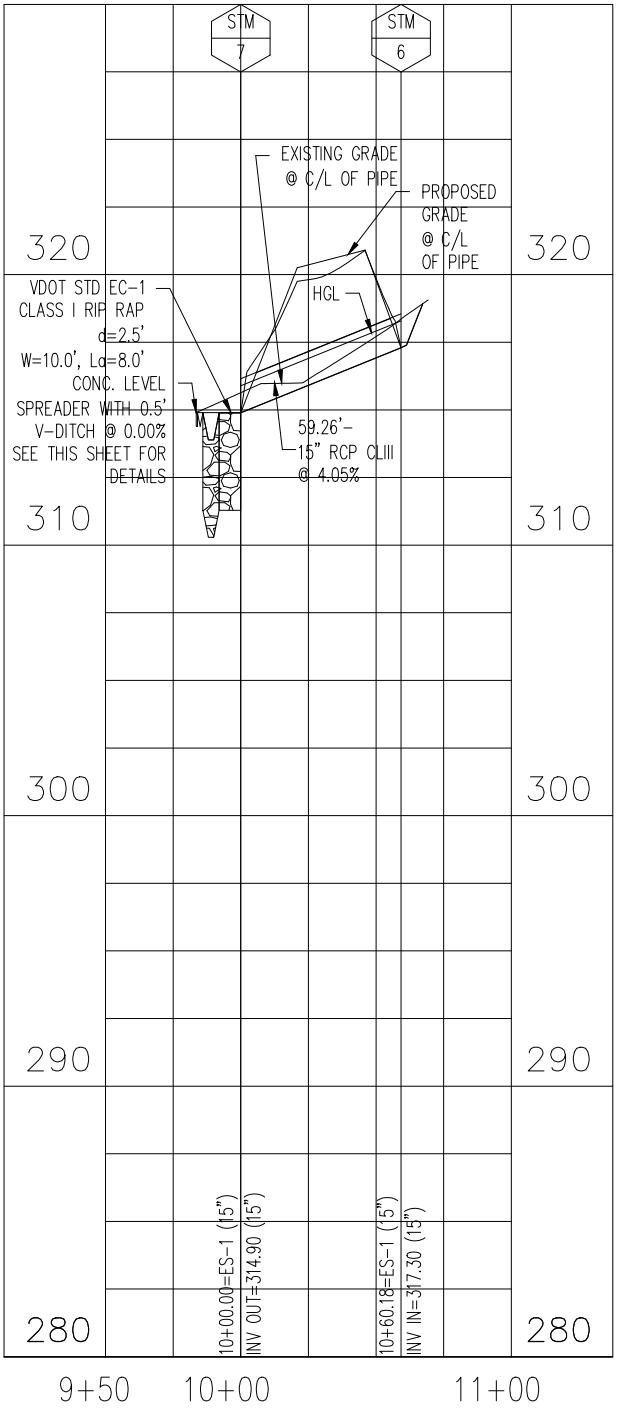


PR1A



PR1B

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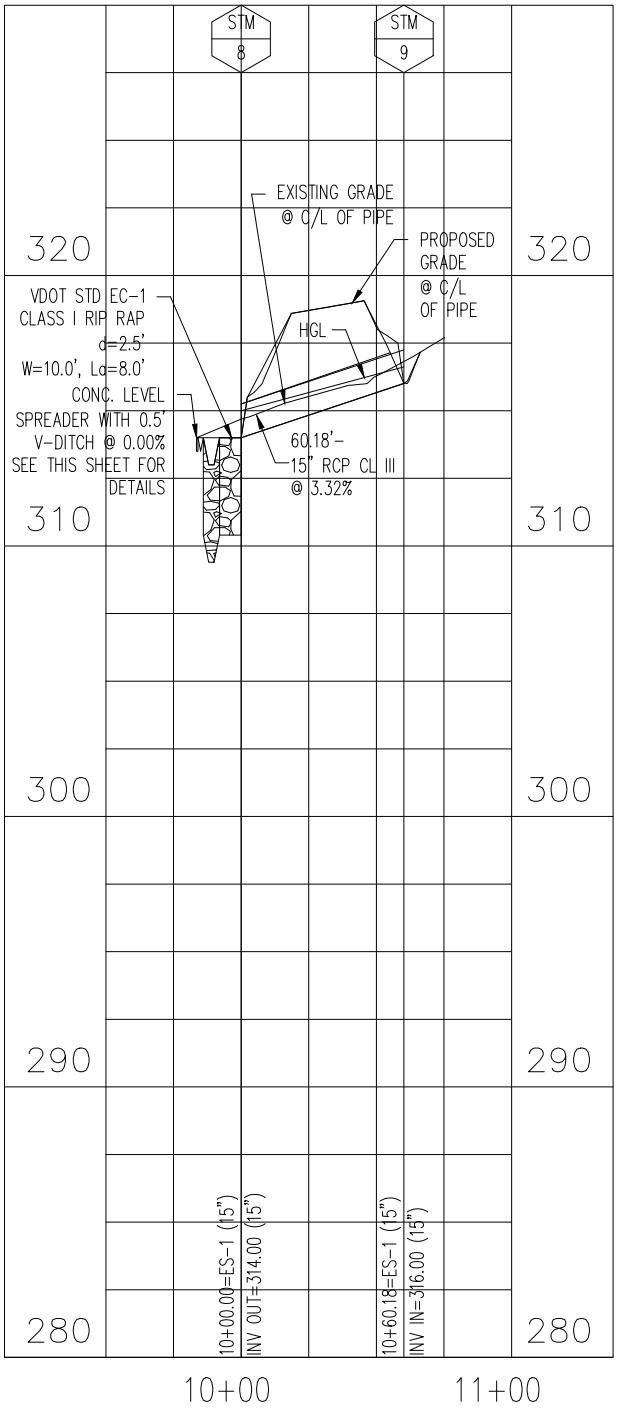
FOR:			FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA		IMPACT PROFILES AND CROSS SECTIONS	10
JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

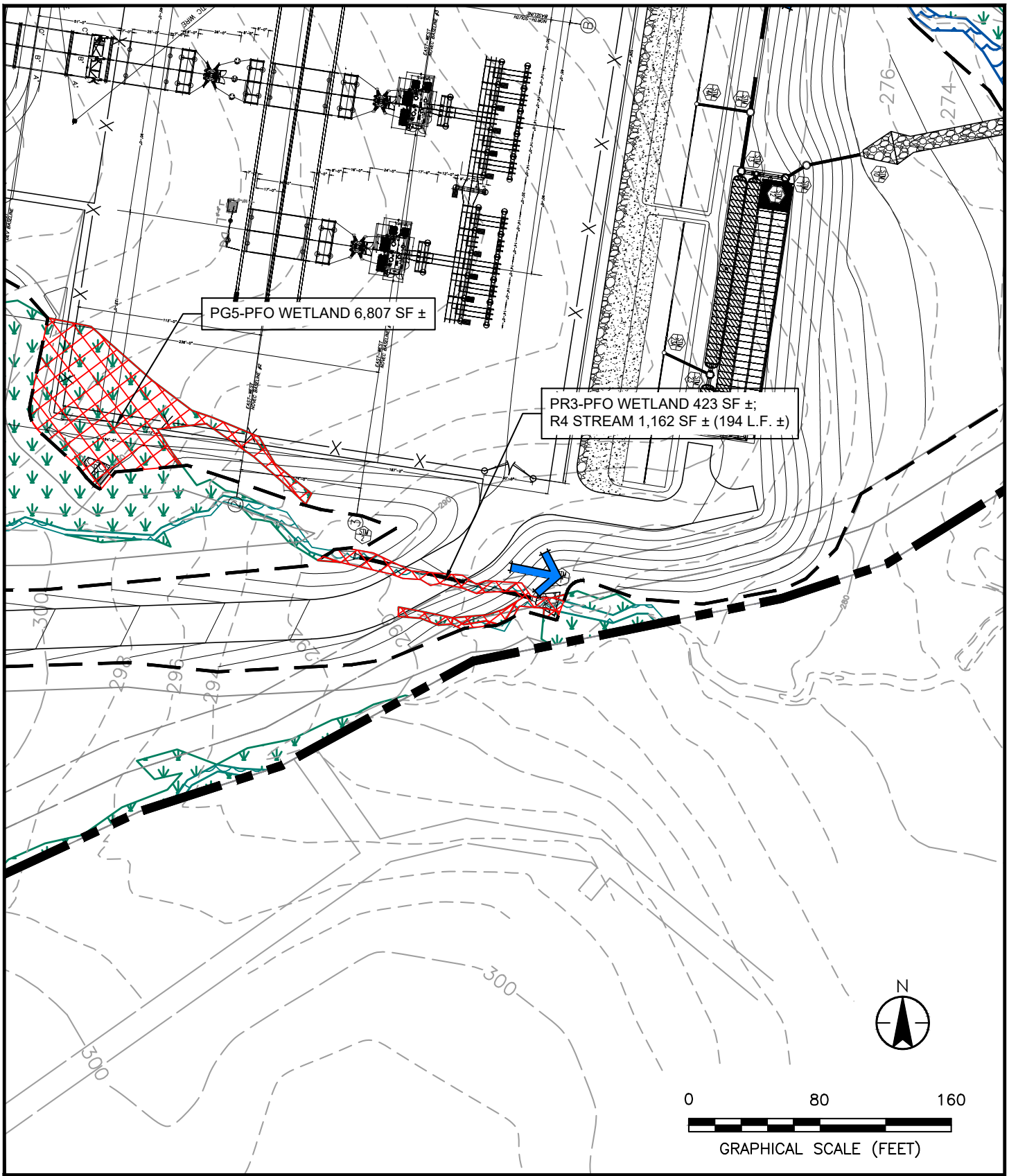
FILEPATH:T:\203401129\03_data\gis_cad\cad\01129n_imp_alt_20200831.dwg|racole|Sep 29, 2020 at 14:44|Layout: 10



PR2

Stantec 150 Riverside Parkway, Suite 301 Fredericksburg, VA 22406 PHONE: (540) 785-5544 FAX: (540) 785-1742	FOR: NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS		FIGURE: 11
	JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

FILEPATH:T:\203401129\03_data\gis_cad\cad\01129n_imp_alt_20200831.dwg|racole|Sep 29, 2020 at 14:44|Layout: 11



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FOR:		IMPACT PROFILES AND CROSS SECTIONS		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA				12
JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

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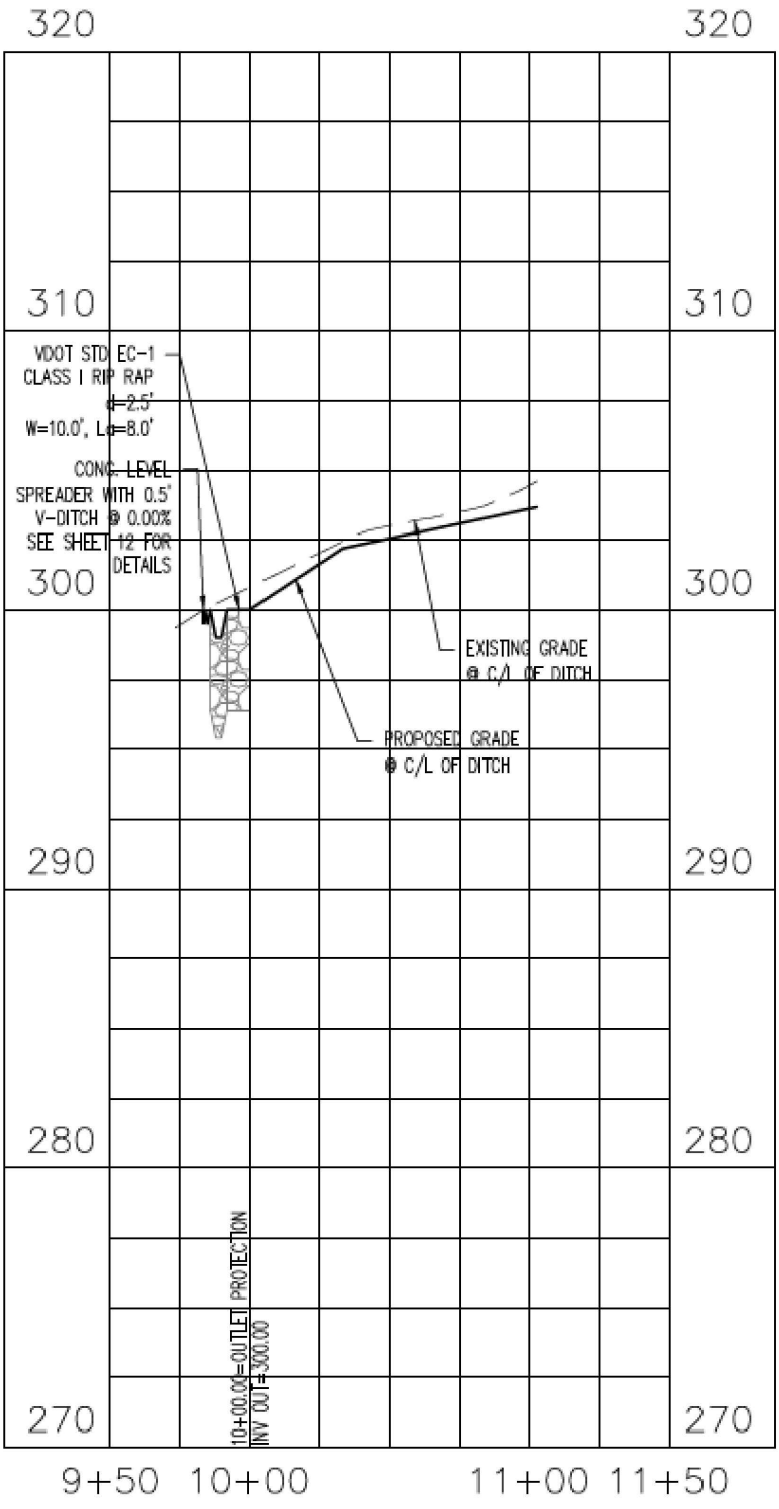

PG5

Stantec 150 Riverside Parkway, Suite 301 Fredericksburg, VA 22406 PHONE: (540) 785-5544 FAX: (540) 785-1742	FOR: NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS		FIGURE: 13
	JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

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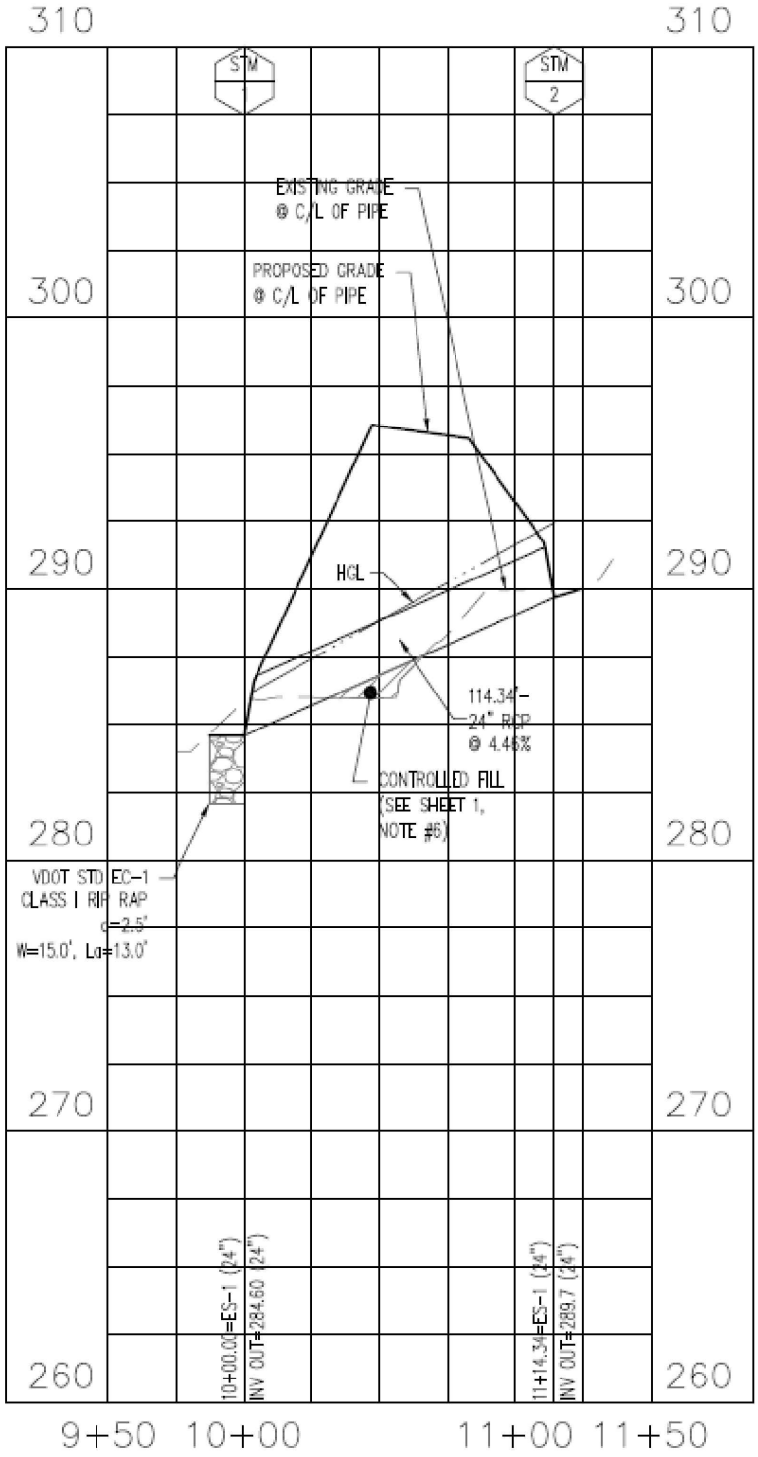


PR3

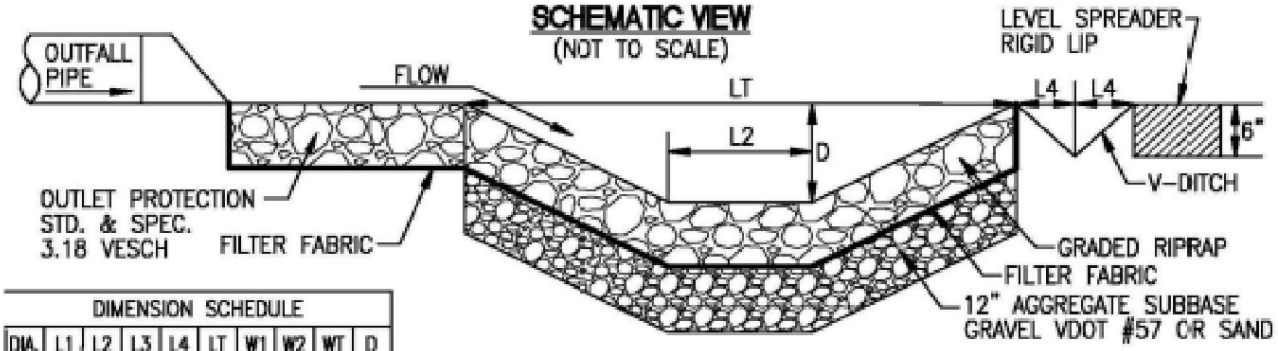
Stantec 150 Riverside Parkway, Suite 301 Fredericksburg, VA 22406 PHONE: (540) 785-5544 FAX: (540) 785-1742	FOR: NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA	IMPACT PROFILES AND CROSS SECTIONS		FIGURE: 14
	JOB NUMBER: 203401129	DRAWN BY: RC	CHECKED BY: AF	APPROVED BY: LC	DATE: SEPTEMBER 2020

FILEPATH:T:\203401129\03_data\gis_cad\cad\01129n_imp_alt_20200831.dwg|racole|Sep 29, 2020 at 14:45|Layout: 14

LEVEL SPREADER WITH PLUNGE POOL

FIGURE 1

SCHEMATIC VIEW
(NOT TO SCALE)

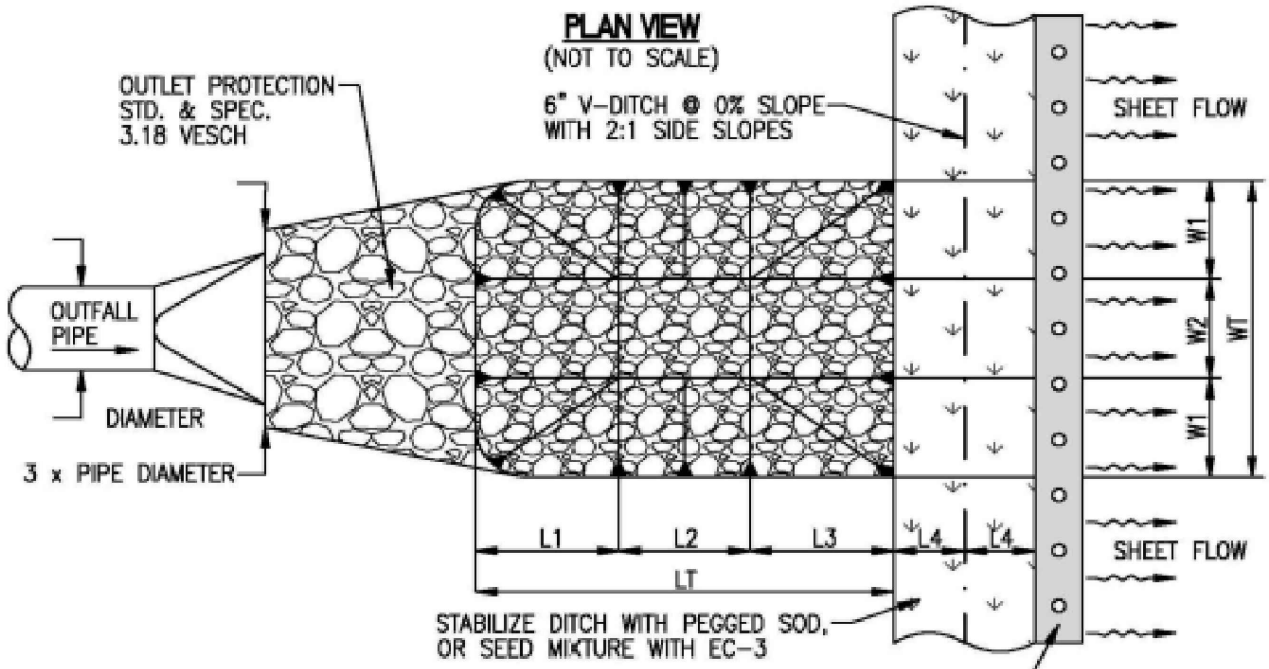


DIMENSION SCHEDULE									
DIA.	L1	L2	L3	L4	LT	W1	W2	WT	D
15"	2'	2'	2'	1'	6'	2'	2'	6'	1'
18"	3'	2'	3'	1'	8'	3'	2'	8'	1'
24"	3'	2'	3'	1'	8'	3'	2'	8'	1'
30"	4'	2'	4'	1'	10'	4'	2'	10'	2'

NOTES;

1. RIPRAP SIZE AND THICKNESS WITHIN PLUNGE POOL SHALL MATCH OUTLET PROTECTION AND FSM REQUIREMENTS.
2. FILTER FABRIC MUST BE PERMEABLE AND MEET THE REQUIREMENTS FOUND IN STD. & SPEC. 3.19 IN THE VESCH.
3. CONSTRUCTION MATERIALS AND DESIGN LENGTH FOR LEVEL SPREADER RIGID LIP SHALL BE EQUIVALENT TO LEVEL SPREADER DETAILS AT THE VA. STORMWATER BMP CLEARINGHOUSE.

PLAN VIEW
(NOT TO SCALE)



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FOR:			FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA		IMPACT PROFILES AND CROSS SECTIONS	15

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
203401129	RC	AF	LC	SEPTEMBER 2020

FILEPATH:T:\203401129\03_data\gis_cad\cad\01129n_imp_alt_20200831.dwg|racole|Sep 29, 2020 at 14:45|Layout: 15

DULLES GREENWAY

PROJECT LIMITS

PROJECT LIMITS

PG1-PFO WETLAND 1,800 SF ±

PG2-PFO WETLAND 678 SF ±

PG3-PFO WETLAND 95 SF ±;
R4 STREAM CHANNEL 324 SF ± (76 L.F. ±)

PG4-PFO WETLAND 1,744 SF ±;
R4 STREAM CHANNEL 753 SF ± (199 L.F. ±)

PG5-PFO WETLAND 33,107 SF ±;
PEM WETLAND 6,711 SF ±
R4 STREAM CHANNEL 3,089 SF ± (764 L.F. ±)

24' ACCESS ROAD

24' ACCESS ROAD

LIMITS OF CLEARING

LIMITS OF CLEARING

LIMITS OF CLEARING

PROPOSED BIORETENTION

PROPOSED BIORETENTION

PROPOSED SWM FACILITY

SYCOLIN ROAD

LEGEND:

- APPROXIMATE FORESTED WETLAND (PFO) LIMITS
- APPROXIMATE EMERGENT WETLAND (PEM) LIMITS
- APPROXIMATE PERENNIAL STREAM CHANNEL (R3) LIMITS
- APPROXIMATE INTERMITTENT STREAM CHANNEL (R4) LIMITS
- PROPOSED FORESTED WETLAND (PFO) IMPACTS
- PROPOSED EMERGENT WETLAND (PEM) IMPACTS
- PROPOSED INTERMITTENT STREAM CHANNEL (R4) IMPACTS LIMITS
- DIRECTION OF FLOW

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)
PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

JURISDICTIONAL AREA IMPACTS:

PERMANENT IMPACTS

PFO WETLANDS	0.86 ACRES ±
PEM WETLANDS	0.15 ACRES ±
R4 STREAM CHANNELS	0.10 ACRES ±
(EXCLUDING WETLANDS)	(1,039 L.F.±)

PERMANENT IMPACTS TABLE

IMPACT	WETLANDS		STREAM CHANNELS	
	PFO	PEM	R4	
	SF	SF	SF	LF
PG1	1,800	-	-	-
PG2	678	-	-	-
PG3	95	-	324	76x4
PG4	1,744	-	753	199x4
PG5	33,107	6,711	3,089	764x4
TOTAL	37,424	6,711	4,166	1,039
ACRES	0.86	0.15	0.10	

LEVEL OF IMPACTS:
P = PERMANENT IMPACT
C = CONVERSION IMPACT
T = TEMPORARY IMPACT

TYPES OF IMPACTS:
G = GRADING IMPACT
R = ROAD IMPACT
U = UTILITY

N

0 80 160

GRAPHICAL SCALE (FEET)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

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FOR: NOVEC WILDWOOD SUBSTATION
LOUDOUN COUNTY, VIRGINIA

OVERALL IMPACTS MAP
ALTERNATIVE 1

FIGURE: 16

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
203401129	RC	AF	LC	APRIL 2020

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DULLES GREENWAY

PG1-PFO WETLAND 257 SF ±

PG2-PFO WETLAND 640 SF ±

PG3-PFO WETLAND 64 SF ±
R4 STREAM 316 SF ± (73 L.F. ±)

PG4-PFO WETLAND 1,744 SF ±
R4 STREAM 954 SF ± (242 L.F. ±)

PG5-PEM WETLAND 8,646 SF ±
PFO WETLAND 32,173 SF ±
R4 STREAM 3,079 SF ± (747 L.F. ±)

PR1-PEM WETLAND 6,255 SF ±

PROJECT LIMITS

PROJECT LIMITS

SYCOLIN ROAD

LEGEND:

- APPROXIMATE FORESTED WETLAND (PFO) LIMITS
- APPROXIMATE EMERGENT WETLAND (PEM) LIMITS
- APPROXIMATE PERENNIAL STREAM CHANNEL (R3) LIMITS
- APPROXIMATE INTERMITTENT STREAM CHANNEL (R4) LIMITS
- PROPOSED FORESTED WETLAND (PFO) IMPACTS
- PROPOSED EMERGENT WETLAND (PEM) IMPACTS
- PROPOSED INTERMITTENT STREAM CHANNEL (R4) IMPACTS LIMITS
- DIRECTION OF FLOW

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)
PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

JURISDICTIONAL AREA IMPACTS:

PERMANENT IMPACTS

PFO WETLANDS	0.80 ACRES ±
PEM WETLANDS	0.34 ACRES ±
R4 STREAM CHANNELS	0.10 ACRES ±
(EXCLUDING WETLANDS)	(1,062 L.F.±)

PERMANENT IMPACTS TABLE

IMPACT	WETLANDS		STREAM CHANNELS	
	PFO	PEM	R4	
	SF	SF	SF	LF
PG1	257	-	-	-
PG2	640	-	-	-
PG3	64	-	316	73x4
PG4	1,744	-	954	242x4
PG5	32,173	8,646	3,079	747x4
PR1	-	6,255	-	-
TOTAL	34,878	14,901	4,349	1,062
ACRES	0.80	0.34	0.10	

LEVEL OF IMPACTS:
P = PERMANENT IMPACT
C = CONVERSION IMPACT
T = TEMPORARY IMPACT

TYPES OF IMPACTS:
G = GRADING IMPACT
R = ROAD IMPACT
U = UTILITY

N

0 80 160

GRAPHICAL SCALE (FEET)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

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FOR: NOVEC WILDWOOD SUBSTATION
LOUDOUN COUNTY, VIRGINIA

OVERALL IMPACTS MAP
ALTERNATIVE 2

FIGURE: 17

JOB NUMBER: 203401129 | DRAWN BY: RC | CHECKED BY: AF | APPROVED BY: LC | DATE: APRIL 2020

DULLES GREENWAY

DULLES GREENWAY (RTE 267)

PROJECT LIMITS

PROJECT LIMITS

SYCOLIN ROAD

PG1-PFO WETLAND 23,110 SF ±;
PEM WETLANDS 940 SF ±;
R4 STREAM 168 SF ± (80 L.F. ±)

PG2-PFO WETLAND 202 SF ±;
R4 STREAM 352 SF ± (85 L.F. ±)

PG3-PFO WETLAND 111 SF ±

PG4-PFO WETLAND 1,744 SF ±;
R4 STREAM 968 SF ± (244 L.F. ±)

PG5-PEM WETLAND 7,296 SF ±;
PFO WETLAND 10,894 SF ±;

PR1-PEM WETLAND 6,674 SF ±;

LEGEND:

- APPROXIMATE FORESTED WETLAND (PFO) LIMITS
- APPROXIMATE EMERGENT WETLAND (PEM) LIMITS
- APPROXIMATE PERENNIAL STREAM CHANNEL (R3) LIMITS
- APPROXIMATE INTERMITTENT STREAM CHANNEL (R4) LIMITS
- PROPOSED FORESTED WETLAND (PFO) IMPACTS
- PROPOSED EMERGENT WETLAND (PEM) IMPACTS
- PROPOSED INTERMITTENT STREAM CHANNEL (R4) IMPACTS LIMITS
- DIRECTION OF FLOW

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)
PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

JURISDICTIONAL AREA IMPACTS:

PERMANENT IMPACTS

PFO WETLANDS	0.83 ACRES ±
PEM WETLANDS	0.34 ACRES ±
R4 STREAM CHANNELS	0.03 ACRES ±
(EXCLUDING WETLANDS)	(409 L.F.±)

PERMANENT IMPACTS TABLE

IMPACT	WETLANDS		STREAM CHANNELS	
	PFO	PEM	R4	
	SF	SF	SF	LF
PG1	23,110	940	168	80x2
PG2	202	-	352	85x4
PG3	111	-	-	-
PG4	1,744	-	968	244x4
PG5	10,894	7,296	-	-
PR1	-	6,674	-	-
TOTAL	36,061	14,910	1,488	409
ACRES	0.83	0.34	0.03	

LEVEL OF IMPACTS:
P = PERMANENT IMPACT
C = CONVERSION IMPACT
T = TEMPORARY IMPACT

TYPES OF IMPACTS:
G = GRADING IMPACT
R = ROAD IMPACT
U = UTILITY

N

0 80 160

GRAPHICAL SCALE (FEET)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

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FOR: NOVEC WILDWOOD SUBSTATION
LOUDOUN COUNTY, VIRGINIA

OVERALL IMPACTS MAP
ALTERNATIVE 3

FIGURE: 18

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
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DULLES GREENWAY

PROJECT LIMITS

PROJECT LIMITS

SYCOLIN ROAD

PG1-PEM WETLAND 127 SF ±

PG2-PFO WETLAND 9,165 SF ±

PG3-PFO WETLAND 92 SF ±;
R4 STREAM 326 SF ± (77 L.F. ±)

PG4-PFO WETLAND 1,744 SF ±;
R4 STREAM 927 SF ± (239 L.F. ±)

PG5-PFO WETLAND 93 SF ±

PG6-PFO WETLAND 22,549 SF ±;
PEM WETLAND 8,288 SF ±;
R4 STREAM 1,663 SF ± (443 L.F. ±)

PR1-PEM WETLAND 6,674 SF ±

LEGEND:

- APPROXIMATE FORESTED WETLAND (PFO) LIMITS
- APPROXIMATE EMERGENT WETLAND (PEM) LIMITS
- APPROXIMATE PERENNIAL STREAM CHANNEL (R3) LIMITS
- APPROXIMATE INTERMITTENT STREAM CHANNEL (R4) LIMITS
- PROPOSED FORESTED WETLAND (PFO) IMPACTS
- PROPOSED EMERGENT WETLAND (PEM) IMPACTS
- PROPOSED INTERMITTENT STREAM CHANNEL (R4) IMPACTS LIMITS
- DIRECTION OF FLOW

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)
PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

JURISDICTIONAL AREA IMPACTS:

PERMANENT IMPACTS

PFO WETLANDS	0.77 ACRES ±
PEM WETLANDS	0.35 ACRES ±
R4 STREAM CHANNELS	0.07 ACRES ±
(EXCLUDING WETLANDS)	(770 L.F.±)

PERMANENT IMPACTS TABLE

IMPACT	WETLANDS		STREAM CHANNELS	
	PFO	PEM	R4	
	SF	SF	SF	LF
PG1	-	127	-	-
PG2	9,165	-	-	-
PG3	92	-	326	77x4
PG4	1,744	-	927	239x4
PG5	93	-	-	-
PG6	22,549	8,288	1,663	443x4
PR1	-	6,674	-	-
TOTAL	33,643	15,089	2,916	759
ACRES	0.77	0.35	0.07	

LEVEL OF IMPACTS:
P = PERMANENT IMPACT
C = CONVERSION IMPACT
T = TEMPORARY IMPACT

TYPES OF IMPACTS:
G = GRADING IMPACT
R = ROAD IMPACT
U = UTILITY

N

0 80 160

GRAPHICAL SCALE (FEET)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

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FOR: NOVEC WILDWOOD SUBSTATION
LOUDOUN COUNTY, VIRGINIA

OVERALL IMPACTS MAP
ALTERNATIVE 4

FIGURE: 19

JOB NUMBER:	DRAWN BY:	CHECKED BY:	APPROVED BY:	DATE:
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National Flood Hazard Layer FIRMette

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Legend

Figure 20

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

- **SPECIAL FLOOD HAZARD AREAS**
  - Without Base Flood Elevation (BFE) *Zone A, V, A99*
  - With BFE or Depth *Zone AE, AO, AH, VE, AR*
  - Regulatory Floodway
- **OTHER AREAS OF FLOOD HAZARD**
  - 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
  - Future Conditions 1% Annual Chance Flood Hazard *Zone X*
  - Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
  - Area with Flood Risk due to Levee *Zone D*
- **OTHER AREAS**
  - NO SCREEN — Area of Minimal Flood Hazard *Zone X*
  - Effective LOMRs
  - Area of Undetermined Flood Hazard *Zone D*
- **GENERAL STRUCTURES**
  - Channel, Culvert, or Storm Sewer
  - Levee, Dike, or Floodwall
- **OTHER FEATURES**
  - 20.2 / 17.5 — Cross Sections with 1% Annual Chance Water Surface Elevation
  - Coastal Transect
  - Base Flood Elevation Line (BFE)
  - Limit of Study
  - Jurisdiction Boundary
  - Coastal Transect Baseline
  - Profile Baseline
  - Hydrographic Feature
- **MAP PANELS**
  - Digital Data Available
  - No Digital Data Available
  - Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 10/17/2019 at 3:41:09 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C – STORMWATER MANAGEMENT PLAN

Received by VMRC February 4, 2021 /blh

MANAGED TURF – UNCONTROLLED (B SOIL) D.A = 1.64 AC.

IMPERVIOUS COVER – UNCONTROLLED (C SOIL) D.A = 0.04 AC.

IMPERVIOUS COVER – UNCONTROLLED (B SOIL) D.A = 0.31 AC.

MANAGED TURF – UNCONTROLLED (D SOIL) D.A = 1.89 AC.

MANAGED TURF – UNCONTROLLED (C SOIL) D.A = 0.20 AC.

IMPERVIOUS COVER – UNCONTROLLED (D SOIL) D.A = 0.40 AC.

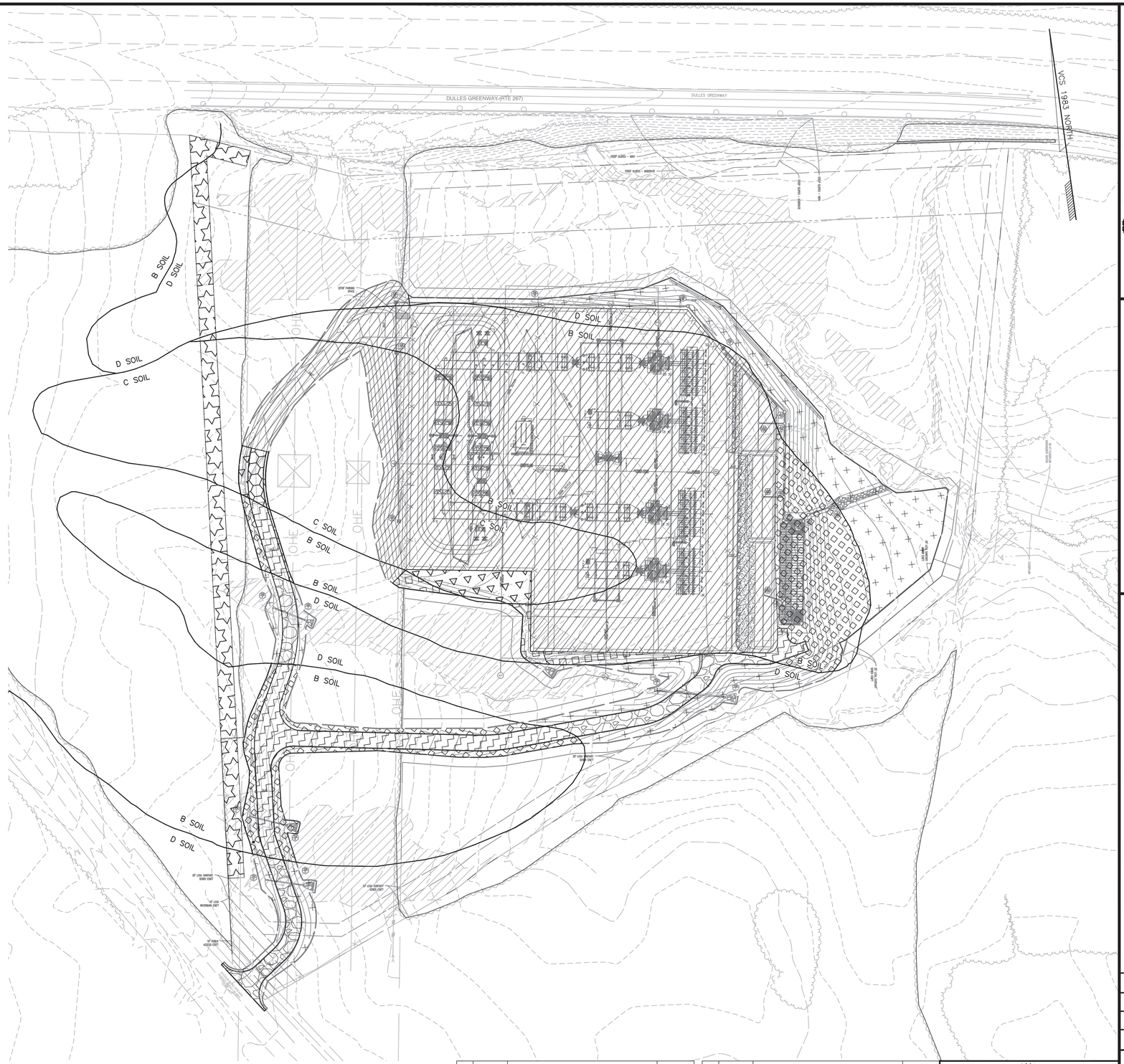
CONTROLLED AREA D.A = 7.18 AC. SEE TABLE BELOW

PROTECTED FOREST/ OPEN SPACE – (WITHIN VRRM ESMT) D.A = 0.70 AC.

CONTROLLED AREA DISTRIBUTION

	Description of Area	Soil Type	CN value	Area(A) (ac)
1.	Open Space - Good Condition	B	61	0.49
2.	Gravel	B	85	4.69
3.	Open Space - Good Condition	C	74	0.51
4.	Gravel	C	89	1.25
5.	Open Space - Good Condition	D	80	0.07
6.	Gravel	D	91	0.17
			Totals =	7.18

	SWM/BMP FACILITY NAME	TYPE OF FACILITY	TOTAL ACRES TREATED	IMPERVIOUS ACRES TREATED	LATITUDE	LONGITUDE	DESCRIPTION OF DISCHARGE POINT
1	Bioretention (Stm-15A)	Level 1 Bioretention	1.98	1.85	39.0467	-77.5398	Discharges directly into Stormtech Isolator Row
2	Bioretention (Stm-14A)	Level 1 Bioretention	1.79	1.68	39.0464	-77.5398	Discharges directly into Stormtech Isolator Row
3	Bioretention (Stm-23A)	Level 1 Bioretention	1.79	1.66	39.0460	-77.5399	Discharges directly into Stormtech Isolator Row
4	StormTech Isolater Row	Manufactured Treatment Device - Filtering	7.18	6.11	39.0461	-77.5397	Outfalls to proposed rip rap outlet protection and into rip rap lined channel



GRAPHIC SCALE

80 0 40 80 160 320

(IN FEET)

1 inch = 80 ft.

NO.	DATE	DESCRIPTION	BY

DEWBERRY REVISIONS

NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
Lic. No. 047045
8/4/20
PROFESSIONAL ENGINEER

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13575 HEATHCOTE BLVD.
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BMP MAP

NOVEC
WILDWOOD SUBSTATION

Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051

Drawn By JH

Designed By JH

Checked By

Date 11/26/2019

Scale AS SHOWN

Sheet 18 of 41

File Number SP-708

Received by VMRC February 4, 2021 /blh

Project Name:	**Wildwood Substation**
Date:	**8/4/2020**

BMP Design Specifications List: **2011 Stds & Specs**

Site Information

Post-Development Project (Treatment Volume and Loads)

Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	
Forest/Open Space (acres) -- undisturbed, protected forest/open space or reforested land		0.26	0.13	0.31	0.70	*
Managed Turf (acres) -- disturbed, graded for yards or other turf to be mowed/managed		2.13	0.71	1.96	4.80	
Impervious Cover (acres)		5.00	1.29	0.57	6.86	
					12.36	

**** Forest/Open Space areas must be protected in accordance with the Virginia Runoff Reduction Method***

Constants

Annual Rainfall (inches)	43
Target Rainfall Event (inches)	1.00
Total Phosphorus (TP) EMC (mg/L)	0.26
Total Nitrogen (TN) EMC (mg/L)	1.86
Target TP Load (lb/acre/yr)	0.41
Pj (unitless correction factor)	0.90

Runoff Coefficients (Rv)

	A Soils	B Soils	C Soils	D Soils
Forest/Open Space	0.02	0.03	0.04	0.05
Managed Turf	0.15	0.20	0.22	0.25
Impervious Cover	0.95	0.95	0.95	0.95

Post-Development Requirement for Site Area

TP Load Reduction Required (lb/yr)	**12.31**

LAND COVER SUMMARY -- POST DEVELOPMENT

Land Cover Summary	
Forest/Open Space Cover (acres)	0.70
Weighted Rv (forest)	0.04
% Forest	6%
Managed Turf Cover (acres)	4.80
Weighted Rv (turf)	0.22
% Managed Turf	39%
Impervious Cover (acres)	6.86
Rv (impervious)	0.95
% Impervious	56%
Site Area (acres)	**12.36**
Site Rv	**0.62**

Treatment Volume and Nutrient Loads	
Treatment Volume (acre-ft)	0.6348
Treatment Volume (cubic feet)	27,652
TP Load (lb/yr)	17.37
TN Load (lb/yr) (Informational Purposes Only)	124.29

Drainage Area A

Drainage Area A Land Cover (acres)

	A Soils	B Soils	C Soils	D Soils	Totals	Land Cover Rv
Forest/Open Space (acres)					0.00	0.00
Managed Turf (acres)		0.49	0.51	0.07	1.07	0.21
Impervious Cover (acres)		4.69	1.25	0.17	6.11	0.95
				Total	7.18	

Total Phosphorus Available for Removal in D.A. A (lb/yr)	13.76
Post Development Treatment Volume in D.A. A (ft³)	21,897

Stormwater Best Management Practices (RR = Runoff Reduction)

--Select from dropdown lists--

Practice	Runoff Reduction Credit (%)	Managed Turf Credit Area (acres)	Impervious Cover Credit Area (acres)	Volume from Upstream Practice (ft³)	Runoff Reduction (ft³)	Remaining Runoff Volume (ft³)	Total BMP Treatment Volume (ft³)	Phosphorus Removal Efficiency (%)	Phosphorus Load from Upstream Practices (lb)	Untreated Phosphorus Load to Practice (lb)	Phosphorus Removed By Practice (lb)	Remaining Phosphorus Load (lb)	Downstream Practice to be Employed
6. Bioretention (RR)													
6.a. Bioretention #1 or Micro-Bioretention #1 or Urban Bioretention (Spec #9)	40	0.37	5.19	0	7,273	10,910	18,184	25	0.00	11.41	6.28	5.14	14.b. MTD - Filtering
14. Manufactured Treatment Devices (no RR)													
14.a. Manufactured Treatment Device-Hydrodynamic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	
14.b. Manufactured Treatment Device-Filtering	0	0.70	0.92	10,910	0	14,623	14,623	40	5.14	2.33	2.99	4.48	None
14.c. Manufactured Treatment Device-Generic	0			0	0	0	0	20	0.00	0.00	0.00	0.00	

TOTAL IMPERVIOUS COVER TREATED (ac)	6.11 **AREA CHECK: OK.**
TOTAL MANAGED TURF AREA TREATED (ac)	1.07 **AREA CHECK: OK.**
TOTAL PHOSPHORUS REMOVAL REQUIRED ON SITE (lb/yr)	12.31
TOTAL PHOSPHORUS AVAILABLE FOR REMOVAL IN D.A. A (lb/yr)	13.76
TOTAL PHOSPHORUS REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	2.99
TOTAL PHOSPHORUS REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	6.28
TOTAL PHOSPHORUS LOAD REDUCTION ACHIEVED IN D.A. A (lb/yr)	9.26
TOTAL PHOSPHORUS REMAINING AFTER APPLYING BMP LOAD REDUCTIONS IN D.A. A (lb/yr)	4.50

SEE WATER QUALITY COMPLIANCE TAB FOR SITE COMPLIANCE CALCULATIONS

NITROGEN REMOVED WITH RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	52.25
NITROGEN REMOVED WITHOUT RUNOFF REDUCTION PRACTICES IN D.A. A (lb/yr)	0.00
TOTAL NITROGEN REMOVED IN D.A. A (lb/yr)	52.25

NO.	DATE	DESCRIPTION	BY

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NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

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Dewberry Engineers Inc.

BMP COMPUTATIONS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number	STPL-2019-0051
Drawn By	JH
Designed By	JH
Checked By	
Date	11/26/2019
Scale	N/A
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File Number	SP-708

Runoff Volume and Curve Number Calculations

Enter design storm rainfall depths (in):

1-year storm	2-year storm	10-year storm
2.53	3.05	4.61

***Notes (see below):**

[1] The curve numbers and runoff volumes computed in this spreadsheet for each drainage area are limited in their applicability for determining and demonstrating compliance with water quantity requirements. See VRRM User's Guide and Documentation for additional information.

[2] Runoff Volume (RV) for pre- and post-development drainage areas must be in volumetric units (e.g., acre-feet or cubic feet) when using the Energy Balance Equation. Runoff measured in watershed-inches and shown in the spreadsheet as RV(watershed-inch) can only be used in the Energy Balance Equation when the pre- and post-development drainage areas are equal. Otherwise RV(watershed-inch) must be multiplied by the drainage area.

[3] Adjusted CNs are based on runoff reduction volumes as calculated in D.A. tabs. An alternative CN adjustment calculation for Vegetated Roofs is included in BMP specification No. 5.

Drainage Area Curve Numbers and Runoff Depths*

Curve numbers (CN, CNadj) and runoff depths ($RV_{developed}$) are computed with and without reduction practices.

Drainage Area A		A Soils	B Soils	C Soils	D Soils
Forest/Open Space -- undisturbed, protected forest/open space or reforested land	Area (acres)	0.00	0.00	0.00	0.00
	CN	30	55	70	77
Managed Turf -- disturbed, graded for yards or other turf to be mowed/managed	Area (acres)	0.00	0.49	0.51	0.07
	CN	39	61	74	80
Impervious Cover	Area (acres)	0.00	4.69	1.25	0.17
	CN	98	98	98	98

Total Area (acres):	7.18
Runoff Reduction Volume (ft^3):	7,273

$CN_{(D.A.\ A)}$ = 94

	1-year storm	2-year storm	10-year storm
$RV_{developed}$ *(watershed-inch)* with no Runoff Reduction*	1.90	2.40	3.92
$RV_{developed}$ *(watershed-inch)* with Runoff Reduction*	1.62	2.12	3.64
Adjusted CN*	91	91	91

See Notes above

Site Results (Water Quality Compliance)

Area Checks	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	AREA CHECK
FOREST/OPEN SPACE (ac)	0.00	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER (ac)	6.11	0.00	0.00	0.00	0.00	OK.
IMPERVIOUS COVER TREATED (ac)	6.11	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA (ac)	1.07	0.00	0.00	0.00	0.00	OK.
MANAGED TURF AREA TREATED (ac)	1.07	0.00	0.00	0.00	0.00	OK.
AREA CHECK	OK.	OK.	OK.	OK.	OK.	

Site Treatment Volume (ft^3) 1

Runoff Reduction Volume and TP By Drainage Area

	D.A. A	D.A. B	D.A. C	D.A. D	D.A. E	TOTAL
RUNOFF REDUCTION VOLUME ACHIEVED (ft^3)	7,273	0	0	0	0	7,273
TP LOAD AVAILABLE FOR REMOVAL (lb/yr)	13.76	0.00	0.00	0.00	0.00	13.76
TP LOAD REDUCTION ACHIEVED (lb/yr)	9.26	0.00	0.00	0.00	0.00	9.26
TP LOAD REMAINING (lb/yr)	4.50	0.00	0.00	0.00	0.00	4.50
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	52.25	0.00	0.00	0.00	0.00	52.25

Total Phosphorus

FINAL POST-DEVELOPMENT TP LOAD (lb/yr)	17.37
TP LOAD REDUCTION REQUIRED (lb/yr)	12.31
TP LOAD REDUCTION ACHIEVED (lb/yr)	9.26
TP LOAD REMAINING (lb/yr):	8.11
REMAINING TP LOAD REDUCTION REQUIRED (lb/yr):	**3.04**

Total Nitrogen (For Information Purposes)

POST-DEVELOPMENT LOAD (lb/yr)	124.29
NITROGEN LOAD REDUCTION ACHIEVED (lb/yr)	52.25
REMAINING POST-DEVELOPMENT NITROGEN LOAD (lb/yr)	72.04

Eco-Cap

April 3, 2020

Jake Holmes, PE
Dewberry
13575 Heathcote Boulevard, Suite 130
Gainesville, VA 20155

Virginia Oaks Nutrient Bank - Credit Availability

Project Reference: Wildwood Substation - Loudoun Academy Drive, Leesburg

This letter is to confirm the availability of Nutrient Credits sufficient to meet your project requirements at the Virginia Oaks Nutrient Bank located in Prince William County, Virginia 8 Digit Hydrologic Unit Code (HUC) 02070010. The nutrient reductions resulting from this activity will generate nonpoint source Nutrient "Credits" which are transferable to those entities requiring nutrient reductions in accordance with the Chesapeake Bay Watershed Nutrient Credit Exchange Program (VA Code § 62. 1-44. 19:14) and the Virginia Stormwater Credit Program (VA Code § 62. 1-44. 15:35).

The Virginia Oaks Nutrient Bank currently has **43.65** pounds of phosphorus Credits available to transfer and will be able to meet your removal requirement of **3.14** Credits.

Feel free to contact me if you require further assistance.

Casey J. Jensen

Casey J. Jensen
President
Eco-Cap, LLC

Credit Sales Coordinator
On behalf of Conservation Plus and the Virginia Oaks Nutrient Bank

Phone: (804) 836-6636 **Email:** ecocapva@gmail.com **Website:** ecocapva.us

BMP NARRATIVE

THE PROPOSED DEVELOPMENT PROPOSES TO REMOVE WOODED VEGETATION AND CONSTRUCT A GRAVEL PAD WITH ACCESS ROAD FOR A UTILITY SUBSTATION. THE REQUIRED TP LOAD REDUCTION FOR THE PROPOSED DEVELOPMENT HAS BEEN DETERMINED TO BE 12.31 LB/YR. IN ORDER TO REDUCE THE TP LOAD TO THE REQUIRED RATE AS STATED BY THE VRRM NEW DEVELOPMENT COMPLIANCE SPREADSHEET, THREE (3) BIORETENTION FACILITIES, A STORMTECH SYSTEM WITH AN ISOLATOR ROW, AND CONSERVATION OF 0.70 ACRES ARE BEING PROPOSED. THE BIORETENTION FACILITIES ARE LOCATED UPSTREAM OF THE STORMTECH SYSTEM WHICH CREATES A TREATMENT TRAIN IN ORDER TO MEET THE TP LOAD REMOVAL REQUIREMENTS. THE COMBINATION OF THE BIORETENTION FACILITIES AND THE STORMTECH ISOLATOR ROW, A TP REDUCTION OF 9.26 LB/YR. THE REMAINING TP LOAD REDUCTION REQUIRED (3.04) WILL BE ACHIEVED THROUGH THE PURCHASE OF OFFSITE CREDITS, SEE THIS SHEET FOR LETTER. OFFSITE CREDITS CAN BE PURCHASED FOR THIS PLAN AS 75% OF THE SITE LOAD REDUCTION REQUIRED IS BEING TREATED ON THE SITE. WITH THE ONSITE IMPROVEMENTS, BIORETENTION FACILITIES, STORMTECH SYSTEM, CONSERVATION OF LAND, AND THE OFFSITE NUTRIENT CREDIT PURCHASES, THE REQUIRED TP REMOVAL LOAD HAS BEEN ACHIEVED.

PER SECTION 5.200 (B)(ii) THE POST DEVELOPMENT NONPOINT SOURCE POLLUTANT LOAD SHALL NOT EXCEED THE PRE-DEVELOPMENT POLLUTANT LOAD BASED UPON AN AVERAGE LAND COVER CONDITION OF 10 PERCENT IMPERVIOUS COVER. THIS CRITERIA HAS BEEN DISCUSSED WITH LOUDOUN COUNTY AND IT WAS DETERMINED THAT BECAUSE THIS SITE FALLS UNDER THE NEW STORMWATER REGULATIONS AND MEETS THE 2B CRITERIA, THIS REQUIREMENT HAS BEEN SATISFIED.

NO.	DATE	DESCRIPTION	BY
		DEWBERRY REVISIONS	

NO.	DATE	DESCRIPTION	BY
		COUNTY REVISIONS	

COMMONWEALTH OF VIRGINIA
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BMP COMPUTATIONS

NOVEC
WILDWOOD SUBSTATION
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Plan Number STPL-2019-0051
Drawn By JH
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Scale N/A
Sheet 20 of 41
File Number SP-708

PLANTING SCHEDULE

REFER TO LANDSCAPE SCHEDULE. SEE SHEET 32,33.

MAINTENANCE OF BIORETENTION

MAINTENANCE INSPECTIONS:
IT IS HIGHLY RECOMMENDED THAT A SPRING MAINTENANCE INSPECTION AND CLEANUP BE CONDUCTED AT EACH BIORETENTION AREA. THE FOLLOWING IS A LIST OF SOME OF THE KEY MAINTENANCE PROBLEMS TO LOOK FOR:

- CHECK TO SEE IF 75% TO 90% COVER (MULCH PLUS VEGETATIVE COVER) HAS BEEN ACHIEVED IN THE BED, AND MEASURE THE DEPTH OF THE REMAINING MULCH.
- CHECK FOR SEDIMENT BUILDUP AT CURB CUTS, GRAVEL DIAPHRAGMS OR PAVEMENT EDGES THAT PREVENTS FLOW FROM GETTING INTO THE BED, AND CHECK FOR OTHER SIGNS OF BYPASSING.
- CHECK FOR ANY WINTER- OR SALT-KILLED VEGETATION, AND REPLACE IT WITH HARDIER SPECIES.
- NOTE PRESENCE OF ACCUMULATED SAND, SEDIMENT AND TRASH IN THE PRE-TREATMENT CELL OR FILTER BEDS, AND REMOVE IT.
- INSPECT BIORETENTION SIDE SLOPES AND GRASS FILTER STRIPS FOR EVIDENCE OF ANY RILL OR GULLY EROSION, AND REPAIR IT.
- CHECK THE BIORETENTION BED FOR EVIDENCE OF MULCH FLOTATION, EXCESSIVE PONDING, DEAD PLANTS OR CONCENTRATED FLOWS, AND TAKE APPROPRIATE REMEDIAL ACTION.
- CHECK INFLOW POINTS FOR CLOGGING, AND REMOVE ANY SEDIMENT.
- LOOK FOR ANY BARE SOIL OR SEDIMENT SOURCES IN THE CONTRIBUTING DRAINAGE AREA, AND STABILIZE THEM IMMEDIATELY.
- CHECK FOR CLOGGED OR SLOW-DRAINING SOIL MEDIA, A CRUST FORMED ON THE TOP LAYER, INAPPROPRIATE SOIL MEDIA, OR OTHER CAUSES OF INSUFFICIENT FILTERING TIME, AND RESTORE PROPER FILTRATION CHARACTERISTICS.

SUGGESTED ANNUAL MAINTENANCE:
TASK - FREQUENCY

- MOWING OF GRASS FILTER STRIPS AND BIORETENTION TURF COVER - AT LEAST 4 TIMES A YEAR
- SPOT WEEDING, EROSION REPAIR, TRASH REMOVAL, AND MULCH RAKING - TWICE DURING GROWING SEASON
- ADD REINFORCEMENT PLANTING TO MAINTAIN DESIRED THE VEGETATION DENSITY - AS NEEDED
- REMOVE INVASIVE PLANTS USING RECOMMENDED CONTROL METHODS - AS NEEDED
- STABILIZE THE CONTRIBUTING DRAINAGE AREA TO PREVENT EROSION - AS NEEDED
- SPRING INSPECTION AND CLEANUP - ANNUALLY
- SUPPLEMENT MULCH TO MAINTAIN A 3 INCH LAYER - ANNUALLY
- PRUNE TREES AND SHRUBS - ANNUALLY
- REMOVE SEDIMENT IN PRE-TREATMENT CELLS AND INFLOW POINTS - ONCE EVERY 2 TO 3 YEARS
- REPLACE THE MULCH LAYER - EVERY 3 YEARS

FILTER MEDIA SPECIFICATIONS

6.6. Filter Media and Surface Cover

The filter media and surface cover are the two most important elements of a bioretention facility in terms of long-term performance. The following are key factors to consider in determining an acceptable soil media mixture.

- ***General Filter Media Composition.*** The recommended bioretention soil mixture is generally classified as a loamy sand on the USDA Texture Triangle, with the following composition:
  - 85% to 88% sand;
  - 8% to 12% soil fines; and
  - 3% to 5% organic matter.

It may be advisable to start with an open-graded coarse sand material and proportionately mix in topsoil that will likely contain anywhere from 30% to 50% soil fines (sandy loam, loamy sand) to achieve the desired ratio of sand and fines. An additional 3% to 5% organic matter can then be added. (The exact composition of organic matter and topsoil material will vary, making particle size distribution and recipe for the total soil media mixture difficult to define in advance of evaluating the available material.)

- ***P-Index.*** The P-Index provides a measure of soil phosphorus content and the risk of that phosphorus moving through the soil media. The risk of phosphorus movement through a soil is influenced by several soil physical properties: texture, structure, total pore space, pore-size, pore distribution, and organic matter. A soil with a lot of fines will hold phosphorus while also limiting the movement of water. A soil that is sandy will have a high permeability, and will therefore be less likely to hold phosphorus within the soil matrix.

  A primary factor in interpreting the desired P-Index of a soil is the bulk density. Saxton et. al. (1986) estimated generalized bulk densities and soil-water characteristics from soil texture. The expected bulk density of the loamy sand soil composition described above should be in the range of 1.6 to 1.7 g/cu. cm. Therefore, ***the recommended range for bioretention soil P-index of between 10 and 30*** corresponds to a ***phosphorus content range (mg of P to kg of soil) within the soil media of 7 mg/kg to 23 mg/kg***.

- ***Cation Exchange Capacity (CEC).*** The CEC of a soil refers to the total amount of positively charged elements that a soil can hold; it is expressed in milliequivalents per 100 grams (meq/100g) of soil. For agricultural purposes, these elements are the basic cations of calcium (Ca^{+2}), magnesium (Mg^{+2}), potassium (K^{+1}) and sodium (Na^{+1}) and the acidic cations of hydrogen (H^{+1}) and aluminum (Al^{+3}). The CEC of the soil is determined in part by the amount of clay and/or humus or organic matter present. ***Soils with CECs exceeding 10 are preferred for pollutant removal.*** Increasing the organic matter content of any soil will help to increase the CEC, since it also holds cations like the clays.

- ***Infiltration Rate.*** The bioretention soil media should have a minimum infiltration rate of 1 to 2 inches per hour (a proper soil mix will have an initial infiltration rate that is significantly higher).

- ***Depth.*** The standard minimum filter bed depth ranges from 24 and 36 inches for Level 1 and Level 2 designs, respectively, (18 to 24 inches for rain gardens or micro-bioretention). If trees are included in the bioretention planting plan, tree planting holes in the filter bed must be at least 4 feet deep to provide enough soil volume for the root structure of mature trees. Use turf, perennials or shrubs instead of trees to landscape shallower filter beds.

- ***Filter Media for Tree Planting Areas.*** A more organic filter media is recommended within the planting holes for trees, with a ratio of 50% sand, 30% toposoil and 20% acceptable leaf compost.

- ***Mulch.*** A 2 to 3 inch layer of mulch on the surface of the filter bed enhances plant survival, suppresses weed growth, and pre-treats runoff before it reaches the filter media. Shredded, aged hardwood bark mulch makes a very good surface cover, as it retains a significant amount of nitrogen and typically will not float away.

- ***Alternative to Mulch Cover.*** In some situations, designers may consider alternative surface covers such as turf, native groundcover, erosion control matting (coir or jute matting), river stone, or pea gravel. The decision regarding the type of surface cover to use should be based on function, cost and maintenance. Stone or gravel are not recommended in parking lot applications, since they increase soil temperature and have low water holding capacity.

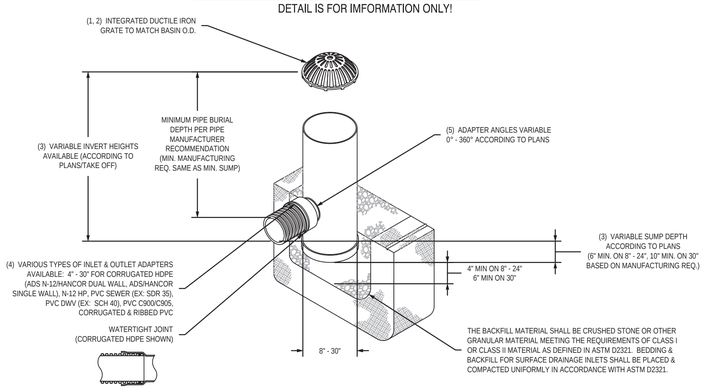
- ***Media for Turf Cover.*** One adaptation is to design the filter media primarily as a sand filter with organic content only at the top. Leaf compost tilled into the top layers will provide organic content for the vegetative cover. If grass is the only vegetation, the ratio of compost may be reduced.

REFER TO VIRGINIA DEQ STORMWATER DESIGN SPECIFICATION NO. 9 FOR ADDITIONAL BIORETETION DETAILS

BIORETENTION STANDARD NOTES & DETAILS

NYLOPLAST DRAIN BASIN WITH DOME GRATE

DETAIL IS FOR IMFORMATION ONLY!



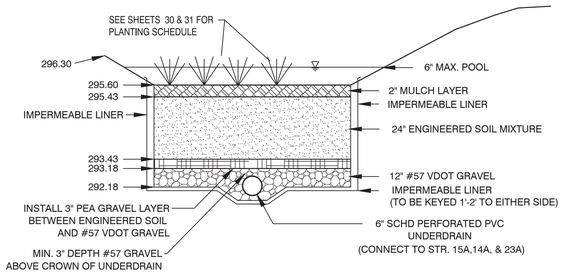
1 - 8" - 30" DOME GRATES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05.
2 - 8" & 10" DOME GRATES FIT ONTO THE DRAIN BASINS WITH THE USE OF A PVC BODY TOP. SEE DRAWING NO. 7001-110-045.
3 - DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS. RISERS ARE NEEDED FOR BASINS OVER 84" DUE TO SHIPPING RESTRICTIONS. SEE DRAWING NO. 7001-110-065.
4 - DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS N-12/HANCOR DUAL WALL), N-12 HP, & PVC SEWER (4" - 24").
5 - ADAPTERS CAN BE MOUNTED ON ANY ANGLE 0° TO 360°. TO DETERMINE MINIMUM ANGLE BETWEEN ADAPTERS SEE DRAWING NO. 7001-110-012.
6 - 8" - 30" DOME GRATES HAVE NO LOAD RATING.

NOTE: A WAIVER HAS BEEN SUBMITTED AND APPROVED TO ALLOW THE USE OF NYLOPLAST STRUCTURES (WAIV-2018-0045)

DRAWN BY EBC	MATERIAL	Nyloplast	3130 VERONA AVE BUFORD, GA 30518 PHN (770) 932-2443 FAX (770) 932-2490 www.nyloplast-us.com
DATE 03-25-10			
REVISED BY CCA	PROJECT NO./NAME		
DATE 09-05-13		TITLE	DRAIN BASIN WITH DOME GRATE QUICK SPEC INSTALLATION DETAIL
DWG SIZE A	SCALE 1:40 SHEET 1 OF 1	DWG NO.	7001-110-397 REV C

BIORETENTION BASIN

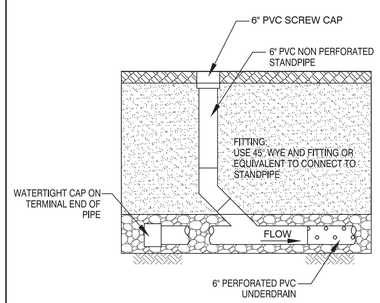
NTS



NOTES:
1. DO NOT USE FILTER FABRICS TO ENCASE ANY PORTION OF THE FACILITY, UNLESS NOTED ON THIS DETAIL.
2. UNDERDRAINS WILL BE UTILIZED SINCE THE SOIL IS UNSUITABLE FOR INFILTRATION.
3. ALL BIORETENTIONS WILL BE INSTALLED WITH AN IMPERMEABLE LINER BENEATH THE #57 VDOT GRAVEL LAYER.
4. SOIL MEDIA IS TO BE PROVIDED BY A CERTIFIED VENDOR.

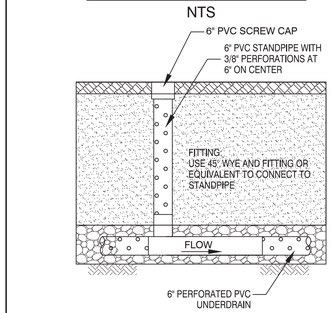
BIORETENTION PVC CLEANOUT

NTS



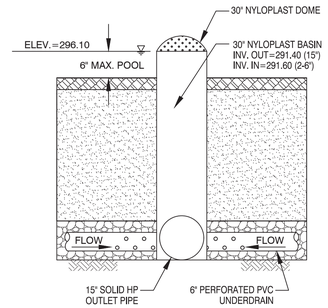
BIORETENTION PVC OBSERVATION WELL

NTS



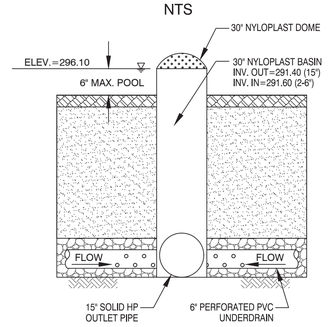
BIORETENTION OVERFLOW BASIN #15A

NTS



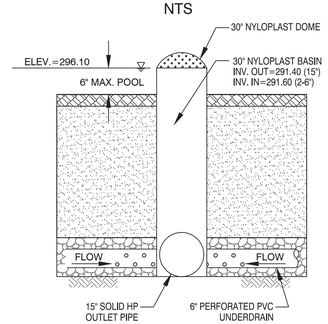
BIORETENTION OVERFLOW BASIN #14A

NTS



BIORETENTION OVERFLOW BASIN #23A

NTS



BIORETENTION DESIGN COMPUTATIONS

Rv				
Soil	A	B	C	D
Forest	0.02	0.03	0.04	0.05
Turf	0.15	0.2	0.22	0.25
Impervious	0.95	0.95	0.95	0.95

STR 15A

TREATMENT VOLUME

Rv	0.90	Imp Area	1.85
A(sqft)	86248.8	Turf Area	0.13
TvBMP(cuft)	6474.105	Total Area	1.98

STORAGE DEPTH	Depth(ft)	Porosity(%)	Storage Depth(ft)
Surface Ponding	0.5	1	0.5
Soil	2	0.25	0.5
Gravel	1	0.4	0.4
		SUM	1.4

SURFACE AREA

SA(sqft)	4624
Proposed (sqft)	4740

STR 14A

TREATMENT VOLUME

Rv	0.90	Imp Area	1.68
A(sqft)	77972.4	Turf Area	0.11
TvBMP(cuft)	5873.34	Total Area	1.79

STORAGE DEPTH	Depth(ft)	Porosity(%)	Storage Depth(ft)
Surface Ponding	0.5	1	0.5
Soil	2	0.25	0.5
Gravel	1	0.4	0.4
		SUM	1.4

SURFACE AREA

SA(sqft)	4195
Proposed (sqft)	4224

STR 23A

TREATMENT VOLUME

Rv	0.90	Imp Area	1.66
A(sqft)	77972.4	Turf Area	0.13
TvBMP(cuft)	5818.89	Total Area	1.79

STORAGE DEPTH	Depth(ft)	Porosity(%)	Storage Depth(ft)
Surface Ponding	0.5	1	0.5
Soil	2	0.25	0.5
Gravel	1	0.4	0.4
		SUM	1.4

SURFACE AREA

SA(sqft)	4156
Proposed (sqft)	4212

BIORETENTION SIZING NARRATIVE:

THE THREE BIORETENTIONS WERE SIZED ACCORDINGLY BASED ON THE RV VALUES. THE RV TABLE AND VALUES SHOWN ON THIS PLAN REFLECT THE TABLE THAT IS USED WITHIN THE VRRM SPREADSHEET, A WEIGHTED RV WAS CALCULATED FOR EACH BIORETENTION BASED ON THE IMPERVIOUS AND PERVIOUS AREAS DRAINING TO EACH BIORETENTION. IN ORDER TO DETERMINE THE TREATMENT VOLUME (TV), THE RV AND THE AREA WERE MULTIPLIED TOGETHER AND THEN DIVIDED BY 12 AS STATED WITHIN THE DEQ BIORETENTION SPECIFICATION FOR SIZING A BIORETENTION. SEE SPECIFICATION 9, PAGE 17 IN THE VA DEQ STORMWATER DESIGN SPECIFICATIONS. THE SURFACE AREA (SA) WAS THEN CALCULATED BASED ON EQUATION 9.3 WITHIN SPECIFICATION 9 WHICH STATES SA=TV/ (STORAGE DEPTH). A CALCULATED SURFACE AREA IS BEING SHOWN ABOVE BASED ON THIS CALCULATION. THE PROPOSED SURFACE AREA IS DISPLAYED UNDERNEATH THE CALCULATED SURFACE AREA. BECAUSE THE PROPOSED SURFACE AREA IS GREATER THAN THE CALCULATED SURFACE AREAS, THE BIORETENTIONS HAVE BEEN SIZED CORRECTLY IN ACCORDANCE TO SPECIFICATION 9.

SECTION 8: CONSTRUCTION

8.1. Construction Sequence

Construction Stage E&S Controls. Micro-bioretention and small-scale bioretention areas should be fully protected by silt fence or construction fencing, particularly if they will rely on infiltration (i.e., have no underdrains). Ideally, bioretention should remain outside the limit of disturbance during construction to prevent soil compaction by heavy equipment. Bioretention basin locations may be used as small sediment traps or basins during construction. However, these must be accompanied by notes and graphic details on the E&S plan specifying that (1) the maximum excavation depth at the construction stage must be at least 1 foot above the post-construction installation, and (2) the facility must contain an underdrain. The plan must also show the proper procedures for converting the temporary sediment control practice to a permanent bioretention facility, including dewatering, cleanout and stabilization.

NO.	DATE	DESCRIPTION	BY
		DEWBERRY REVISIONS	

NO.	DATE	DESCRIPTION	BY
		COUNTY REVISIONS	

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BIORETENTION DETAILS & NARRATIVE

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number	STPL-2019-0051
Drawn By	JH
Designed By	JH
Checked By	
Date	11/26/2019
Scale	AS NOTED
Sheet	21 of 41
File Number	SP-708

Offsite

Time of Concentration Computations for Pre Development Conditions

Sheet flow Segment ID		A2-B2	
Surface description		GRASS	
Manning's roughness coeff., n		0.15	
Flow length, L	(ft)	100	
Two-yr 24-hr rainfall, P2	(in)	3.05	
Land slope, s	(ft/ft)	0.010	
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.221	
Shallow concentrated flow Segment ID		B2-C2	
Surface description		Unpaved	
Flow length, L	(ft)	2322	
Watercourse slope, s	(ft/ft)	0.0300	ACCUMULATIVE TC A2-B2 0.452
Average velocity, V	(fps)	2.8	
Tt = L/(3600*V)	(hr)	0.231	
Channel/Pipe flow Segment ID		C2-D2	
Pipe Diameter	(in)		
Channel Data			
bottom width	(ft)	1	
side slope	z:1	5	
depth	(ft)	1	
Cross sectional flow area, a		6.000	
Wetted perimeter, Pw		11.198	
Hydraulic radius, r = a/Pw		0.536	
Channel slope, s	(ft/ft)	0.0260	
Manning's roughness coeff., n		0.045	
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.522	ACCUMULATIVE TC A2-D2 0.508
Flow length, L	(ft)	709	
Tt = L/(3600*V); Compute Tt	(hr)	0.056	
Channel/Pipe flow Segment ID		D2-E2	
Pipe Diameter	(in)		
Channel Data			
bottom width	(ft)	1	
side slope	z:1	5	
depth	(ft)	1	
Cross sectional flow area, a		6.000	
Wetted perimeter, Pw		11.198	
Hydraulic radius, r = a/Pw		0.536	
Channel slope, s	(ft/ft)	0.0270	
Manning's roughness coeff., n		0.045	
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.589	ACCUMULATIVE TC A2-E2 0.563
Flow length, L	(ft)	716	
Tt = L/(3600*V); Compute Tt	(hr)	0.055	
Channel/Pipe flow Segment ID		E2-F2	
Pipe Diameter	(in)		
Channel Data			
bottom width	(ft)	1	
side slope	z:1	4	
depth	(ft)	1	
Cross sectional flow area, a		5.000	
Wetted perimeter, Pw		9.246	
Hydraulic radius, r = a/Pw		0.541	
Channel slope, s	(ft/ft)	0.0210	
Manning's roughness coeff., n		0.045	
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.185	
Flow length, L	(ft)	238	
Tt = L/(3600*V); Compute Tt	(hr)	0.021	
Watershed time of concentration, Tc	(hrs)	**0.584**	

ONSITE

Time of Concentration Computations for Predeveloped Conditions

Sheet flow Segment ID		A1-B1	
Surface description		Grass	
Manning's roughness coeff., n		0.15	
Flow length, L	(ft)	100	
Two-yr 24-hr rainfall, P2	(in)	3.05	
Land slope, s	(ft/ft)	0.060	
Tt = [0.007(nL)^0.8]/[(P2^0.5)(s^0.4)]	(hr)	0.108	
Shallow concentrated flow Segment ID		B1-C1	
Surface description		Unpaved	
Flow length, L	(ft)	770	
Watercourse slope, s	(ft/ft)	0.0590	ACCUMULATIVE TC A1-C1 0.163
Average velocity, V	(fps)	3.9	
Tt = L/(3600*V)	(hr)	0.055	
Shallow concentrated flow Segment ID		C1-E2	
Pipe Diameter	(in)	0	
Channel Data			
bottom width	(ft)	1	
side slope	z:1	20	
depth	(ft)	1	
Cross sectional flow area, a		21.000	
Wetted perimeter, Pw		41.050	
Hydraulic radius, r = a/Pw		0.512	
Channel slope, s		0.0800	
Manning's roughness coeff., n		0.035	
V =(1.49*r^2/3*s^1/2)/n; Compute V		7.702	
Flow length, L	(ft)	107	
Tt = L/(3600*V); Compute Tt	(hr)	0.004	
Watershed time of concentration, Tc	(hrs)	**0.167**	

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)

1 inch = 200 ft.

ONSITE
D.A = 11.66 AC.
CN = 63.50

OFFSITE
D.A = 118.15 AC.
CN = 74.88

NOTE:
SEE SHEET 29 SHOWING CN COMPUTATIONS

NO.	DATE	DESCRIPTION	BY

DEWBERRY REVISIONS

NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

COMMONWEALTH OF VIRGINIA
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Lic. No. 047045
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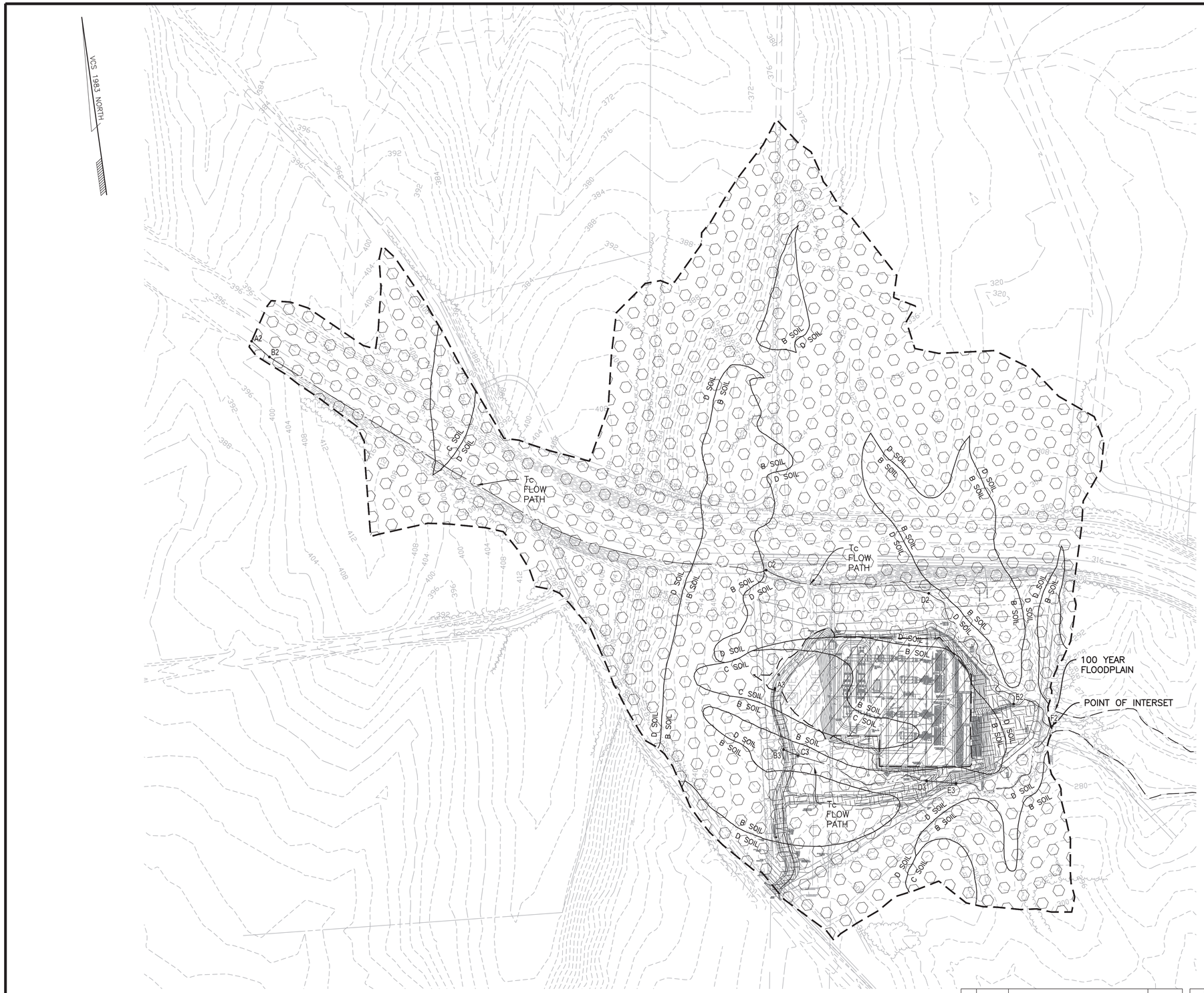
PRE-DEVELOPMENT MAP

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale 1" = 200'
Sheet 22 Of 41
File Number SP-708



Offsite

Time of Concentration Computations for Post Development Conditions

Sheet flow Segment ID		A2-B2
Surface description		GRASS
Manning's roughness coeff., n		0.15
Flow length, L	(ft)	100
Two-yr 24-hr rainfall, P2	(in)	3.05
Land slope, s	(ft/ft)	0.010
Tt = [0.007(nL)^0.8]/[(P2*0.5)(s^0.4)]	(hr)	0.221

Shallow concentrated flow Segment ID		B2-C2
Surface description		Unpaved
Flow length, L	(ft)	2322
Watercourse slope, s	(ft/ft)	0.0300
Average velocity, V	(fps)	2.8
Tt = L/(3600*V)	(hr)	0.231

ACCUMULATIVE TC A2-B2 0.452

Channel/Pipe flow Segment ID		C2-D2
Pipe Diameter	(in)	
Channel Data		
bottom width	(ft)	1
side slope	z:1	5
depth	(ft)	1
Cross sectional flow area, a		6.000
Wetted perimeter, Pw		11.198
Hydraulic radius, r = a/Pw		0.536
Channel slope, s	(ft/ft)	0.0260
Manning's roughness coeff., n		0.045
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.522
Flow length, L	(ft)	709
Tt = L/(3600*V); Compute Tt	(hr)	0.056

ACCUMULATIVE TC A2-D2 0.508

Channel/Pipe flow Segment ID		D2-E2
Pipe Diameter	(in)	
Channel Data		
bottom width	(ft)	1
side slope	z:1	5
depth	(ft)	1
Cross sectional flow area, a		6.000
Wetted perimeter, Pw		11.198
Hydraulic radius, r = a/Pw		0.536
Channel slope, s	(ft/ft)	0.0270
Manning's roughness coeff., n		0.045
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.589
Flow length, L	(ft)	716
Tt = L/(3600*V); Compute Tt	(hr)	0.055

ACCUMULATIVE TC A2-E2 0.563

Channel/Pipe flow Segment ID		E2-F2
Pipe Diameter	(in)	
Channel Data		
bottom width	(ft)	1
side slope	z:1	4
depth	(ft)	1
Cross sectional flow area, a		5.000
Wetted perimeter, Pw		9.246
Hydraulic radius, r = a/Pw		0.541
Channel slope, s	(ft/ft)	0.0210
Manning's roughness coeff., n		0.045
V =(1.49*r^2/3*s^1/2)/n; Compute V		3.185
Flow length, L	(ft)	238
Tt = L/(3600*V); Compute Tt	(hr)	0.021
Watershed time of concentration, Tc	(hrs)	**0.584**

ONSITE (UNCONTROLLED) AREA
ASSUME 5 MINUTES FOR TIME OF CONCENTRATION

ONSITE (CONTROLLED) AREA
ASSUME 5 MINUTES FOR TIME OF CONCENTRATION

GRAPHIC SCALE
200 0 100 200 400 800
(IN FEET)
1 inch = 200 ft.

ONSITE & OFFSITE (CONTROLLED)
D.A = 8.11 AC.
CN = 82.27

ONSITE (UNCONTROLLED)
D.A = 4.48 AC.
CN = 74.19

OFFSITE (UNCONTROLLED)
D.A = 117.34 AC.
CN = 74.89

NOTES:
1. SEE SHEETS 28 & 29 SHOWING CN COMPUTATIONS
2. ONSITE (CONTROLLED) INCLUDES 0.53 ACRES OF OFFSITE WATER BEING CONTROLLED ONSITE. FOR ENERGY BALANCE PURPOSES, THE 0.53 ACRES IS CONSIDERED OFFSITE WHEN PERFORMING THE ADEQUATE OUTFALL ANALYSIS.

NO.	DATE	DESCRIPTION	BY
		DEWBERRY REVISIONS	

NO.	DATE	DESCRIPTION	BY
		COUNTY REVISIONS	

COMMONWEALTH OF VIRGINIA
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POST-DEVELOPMENT MAP

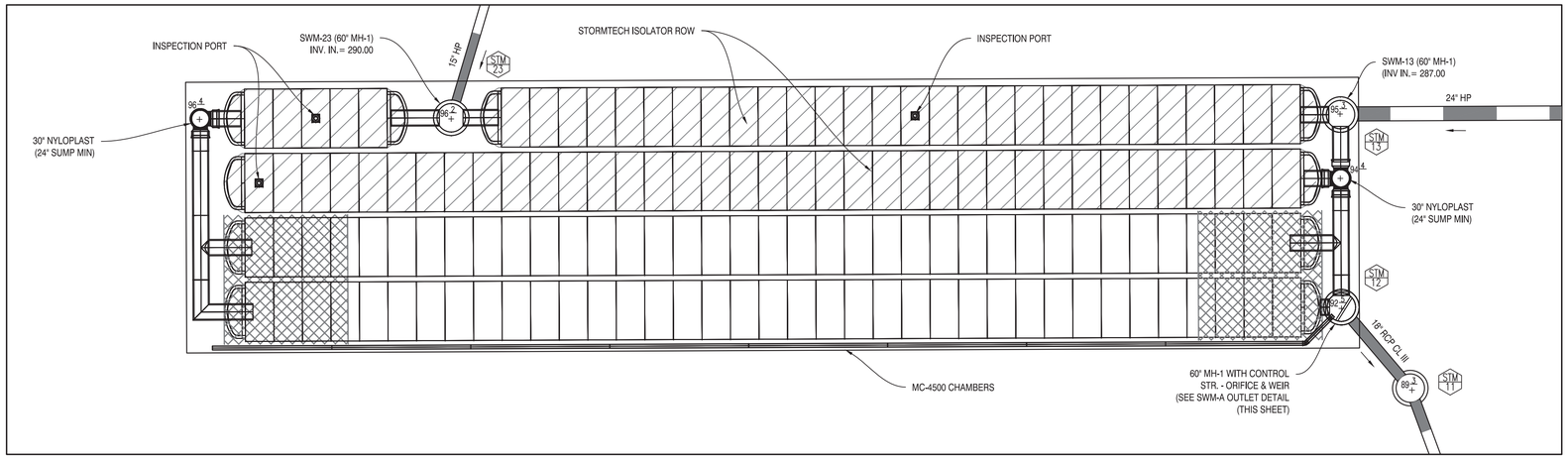
NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale 1"=200'
Sheet 23 of 41
File Number SP-708

Received by VMRC February 4, 2021 /blh

PROPOSED LAYOUT: SWM-A

SCALE: 1"=10'



Maintenance Overview of a Retention/Detention System

Maintaining a clean and obstruction-free retention/detention system helps to ensure the system performs the intended function of the primary design. Build up of debris may obstruct flow through the laterals in a retention system or block the entranceway of the outlet pipe in a detention system. This may result in ineffective operation or complete failure of the system . Additionally, surrounding areas may potentially run the risk of damage due to flooding or other similar issues.

Inspection/Maintenance Frequency

All retention/detention systems must be cleaned and maintained. Underground systems may be maintained more cost effectively if these simple guidelines are followed. Inspection should be performed at a minimum of once per year. Cleaning should be done at the discretion of individuals responsible to maintain proper storage and flow. While maintenance can generally be performed year round, it should be scheduled during a relatively dry season.

Pre-Inspection

A post-installation inspection should be performed to allow the owner to measure the invert prior to accumulation of sediment. This survey will allow the monitoring of sediment build-up without requiring access to the retention/detention system.

The following is the recommended procedure for pre-inspections:

1) Locate the riser section or cleanouts of the retention/detention system. The riser will typically be 24" in diameter or larger and the cleanouts are usually 4", 6" or 8" in diameter.
2) Remove the lid of the riser or clean outs.
3) Insert a measuring device into the opening and make note to a point of reference on the stick or string. (This is done so that sediment build up can be determined in the future without having to enter the system.)

Inspection/Maintenance

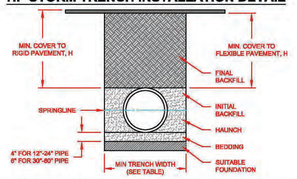
A retention/detention system should be inspected at a minimum of one time a year or after major rain events if necessary.

The following is the recommended procedure to inspect system in service:

1) Locate the riser section of the retention/detention system. The riser will typically be 24" in diameter or larger.
2) Remove the lid from the riser.
3) Measure the sediment buildup at each riser and cleanout location. Only certified confined space entry personnel having appropriate equipment should be permitted to enter the retention/detention System.
4) Inspect each manifold, all laterals, and outlet pipes for sediment build up, obstructions, or other problems. Obstructions should be removed at this time.
5) If measured sediment build up is between 5% - 20% of the pipe diameter, cleaning should be considered; if sediment build up exceeds 20%, cleaning should be performed at the earliest opportunity. A thorough cleaning of the system (manifolds and laterals) shall be performed by either manual methods or by a vacuum truck.

*SEE NOTE #1

HP STORM TRENCH INSTALLATION DETAIL



NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION, WITH THE EXCEPTION THAT THE INITIAL BACKFILL MAY EXTEND TO THE CROWN OF THE PIPE. SOIL CLASSIFICATIONS ARE PER THE LATEST VERSION OF ASTM D2321. CLASS IVB MATERIALS (MH, CH) AS DEFINED IN PREVIOUS VERSIONS OF ASTM D2321 ARE NOT APPROPRIATE BACKFILL MATERIALS.
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL, WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER. AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 12"-24" (300mm-600mm) DIAMETER PIPE; 6" (150mm) FOR 30"-60" (750mm-1500mm) DIAMETER PIPE. THE MIDDLE 1/3 BENEATH THE PIPE (INVERT SHALL BE LOOSELY PLACED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II, III, OR IV IN THE PIPE ZONE EXTENDING TO THE CROWN OF THE PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION. COMPACTION SHALL BE SPECIFIED BY THE ENGINEER IN ACCORDANCE WITH TABLE 3 FOR THE APPLICABLE FILL HEIGHTS LISTED. PLEASE NOTE, CLASS IV MATERIAL HAS LIMITED APPLICATION AND CAN BE DIFFICULT TO PLACE AND COMPACT; USE ONLY WITH THE APPROVAL OF A SOIL EXPERT.
6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" (300mm) FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATION. FOR TRAFFIC APPLICATIONS, CLASS I OR II MATERIAL COMPACTED TO 90% SPD AND CLASS III COMPACTED TO 95% SPD IS REQUIRED. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" (300mm) UP TO 48" (1200mm) DIAMETER PIPE AND 24" (600mm) OF COVER FOR 60" (1500mm) DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.
7. FOR ADDITIONAL INFORMATION SEE TECHNICAL NOTE 2.04.

TABLE 1, RECOMMENDED MINIMUM TRENCH WIDTHS

PIPE DIAM.	MIN. TRENCH WIDTH
12" (300mm)	30" (762mm)
15" (375mm)	34" (864mm)
18" (450mm)	36" (914mm)
24" (600mm)	48" (1219mm)
30" (750mm)	56" (1422mm)
36" (900mm)	64" (1626mm)
42" (1050mm)	72" (1829mm)
48" (1200mm)	80" (2032mm)
60" (1500mm)	96" (2438mm)

TABLE 2, MINIMUM RECOMMENDED COVER BASED ON VEHICLE LOADING CONDITIONS

PIPE DIAM.	SURFACE LIVE LOADING CONDITION H-25	HEAVY CONSTRUCTION (75T AXLE LOAD) *
12" - 48" (300mm - 1200mm)	12" (300mm)	48" (1219mm)
60" (1500mm)	24" (610mm)	60" (1524mm)

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

TABLE 3, MAXIMUM COVER FOR ADS HP STORM PIPE, ft

PIPE DIA	CLASS I COMPACTED	CLASS II 95%	CLASS II 90%	CLASS II 85%	CLASS III 95%	CLASS III 90%	CLASS IV 95%
12" (300mm)	41 (12.5m)	28 (8.5m)	21 (6.4m)	16 (4.9m)	20 (6.1m)	16 (4.9m)	16 (4.9m)
15" (375mm)	42 (12.8m)	29 (8.8m)	21 (6.4m)	16 (4.9m)	21 (6.4m)	16 (4.9m)	16 (4.9m)
18" (450mm)	44 (13.4m)	30 (9.1m)	21 (6.4m)	16 (4.9m)	22 (6.7m)	17 (5.2m)	15 (4.6m)
24" (600mm)	37 (11.3m)	26 (7.9m)	18 (5.5m)	14 (4.3m)	18 (5.5m)	14 (4.3m)	14 (4.3m)
30" (750mm)	39 (11.9m)	27 (8.2m)	19 (5.8m)	14 (4.3m)	19 (5.8m)	15 (4.6m)	14 (4.3m)
36" (900mm)	29 (8.6m)	20 (6.1m)	14 (4.3m)	10 (3.0m)	14 (4.3m)	11 (3.4m)	10 (3.0m)
42" (1050mm)	30 (9.1m)	21 (6.4m)	14 (4.3m)	10 (3.0m)	15 (4.6m)	11 (3.4m)	10 (3.0m)
48" (1200mm)	29 (8.8m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	10 (3.0m)
60" (1500mm)	29 (8.8m)	20 (6.1m)	14 (4.3m)	9 (2.7m)	14 (4.3m)	10 (3.0m)	9 (2.7m)

FILL HEIGHT TABLE GENERATED USING AASHTO SECTION 12, LOAD RESISTANCE FACTOR DESIGN (LRFD) PROCEDURE WITH THE FOLLOWING ASSUMPTIONS:
NO HYDROSTATIC PRESSURE
UNIT WEIGHT OF SOIL (ys) = 120 PCF

*SEE NOTE #1

REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D
6	REV. MAXIMUM COVER HEIGHTS	RWD	01/11/17	

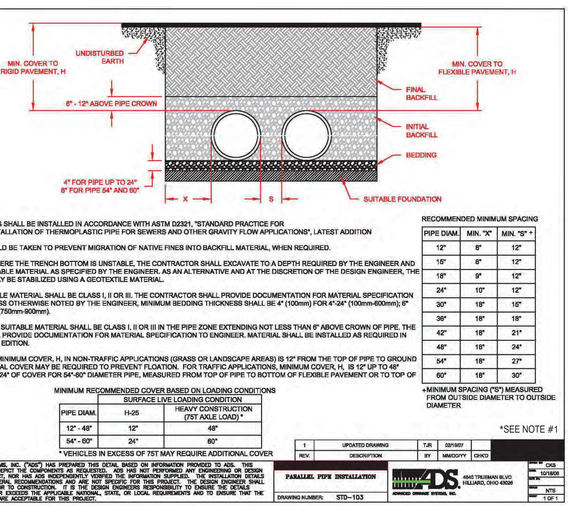
TRENCH INSTALLATION DETAIL (HP STORM)

DRAWING NUMBER: STD-101D

4640 TRUEMAN BLVD HILLIARD, OHIO 43026

ADVANCED DRAINAGE SYSTEMS, INC.

CAD 01/26/06 DWG NTS SHT 1 OF 1



NOTES:

1. ALL PIPE SYSTEMS SHALL BE INSTALLED IN ACCORDANCE WITH ASTM D2321, "STANDARD PRACTICE FOR UNDERGROUND INSTALLATION OF THERMOPLASTIC PIPE FOR SEWERS AND OTHER GRAVITY FLOW APPLICATIONS", LATEST ADDITION
2. MEASURES SHOULD BE TAKEN TO PREVENT MIGRATION OF NATIVE FINES INTO BACKFILL MATERIAL WHEN REQUIRED.
3. FOUNDATION: WHERE THE TRENCH BOTTOM IS UNSTABLE, THE CONTRACTOR SHALL EXCAVATE TO A DEPTH REQUIRED BY THE ENGINEER AND REPLACE WITH SUITABLE MATERIAL AS SPECIFIED BY THE ENGINEER, AS AN ALTERNATIVE AND AT THE DISCRETION OF THE DESIGN ENGINEER, THE TRENCH BOTTOM MAY BE STABILIZED USING A GEOTEXTILE MATERIAL.
4. BEDDING: SUITABLE MATERIAL SHALL BE CLASS I, II OR III. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. UNLESS OTHERWISE NOTED BY THE ENGINEER, MINIMUM BEDDING THICKNESS SHALL BE 4" (100mm) FOR 4"-24" (100mm-600mm); 6" (150mm) FOR 30"-60" (750mm-900mm).
5. INITIAL BACKFILL: SUITABLE MATERIAL SHALL BE CLASS I, II OR III IN THE PIPE ZONE EXTENDING NOT LESS THAN 6" ABOVE CROWN OF PIPE. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION FOR MATERIAL SPECIFICATION TO ENGINEER. MATERIAL SHALL BE INSTALLED AS REQUIRED IN ASTM D2321, LATEST EDITION.
6. MINIMUM COVER: MINIMUM COVER, H, IN NON-TRAFFIC APPLICATIONS (GRASS OR LANDSCAPE AREAS) IS 12" FROM THE TOP OF PIPE TO GROUND SURFACE. ADDITIONAL COVER MAY BE REQUIRED TO PREVENT FLOATION. FOR TRAFFIC APPLICATIONS, MINIMUM COVER, H, IS 12" UP TO 48" DIAMETER PIPE AND 24" OF COVER FOR 54"-60" DIAMETER PIPE, MEASURED FROM TOP OF PIPE TO BOTTOM OF FLEXIBLE PAVEMENT OR TO TOP OF RIGID PAVEMENT.

MINIMUM RECOMMENDED COVER BASED ON LOADING CONDITIONS

PIPE DIAM.	SURFACE LIVE LOADING CONDITION H-25	HEAVY CONSTRUCTION (75T AXLE LOAD) *
12" - 48"	12"	48"
54" - 60"	24"	60"

* VEHICLES IN EXCESS OF 75T MAY REQUIRE ADDITIONAL COVER

RECOMMENDED MINIMUM SPACING

PIPE DIAM.	MIN. "X"	MIN. "S" +
12"	8"	12"
15"	8"	12"
18"	9"	12"
24"	10"	12"
30"	18"	18"
36"	18"	18"
42"	18"	21"
48"	18"	24"
54"	18"	27"
60"	18"	30"

+MINIMUM SPACING ("S") MEASURED FROM OUTSIDE DIAMETER TO OUTSIDE DIAMETER

*SEE NOTE #1

REV.	DESCRIPTION	BY	MM/DD/YY	CHK'D
1	UPDATED DRAWING	TJR	03/19/07	

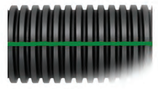
PARALLEL PIPE INSTALLATION

DRAWING NUMBER: STD-103

4640 TRUEMAN BLVD HILLIARD, OHIO 43026

ADVANCED DRAINAGE SYSTEMS, INC.

CKS 10/18/06 DWG NTS SHT 1 OF 1



THE MOST ADVANCED NAME IN DRAINAGE SYSTEMS

February 24, 2020

Jake Holmes
Dewberry
Gainesville, VA

Re: Wildwood Substation Stormtech Review Letter

Mr. Holmes:

Advanced Drainage Systems has reviewed the plans for this project. We have reviewed the design and found it meets the fill height min/max requirements for the MC4500 Chambers in accordance with AASHTO LFRD 12.12 and required by Loudoun County. The Chambers have also been designed in accordance with ASTM F2787, "Standard Practice for Structural Design of Thermoplastic Corrugated Wall Stormwater Collection Chambers"

The Chambers supplied for this project shall meet **ASTM F2418-16** "Standard Specification for Polypropylene Corrugated Wall Stormwater Collection Chambers", with Designation SS.

The Isolator Rows for water quality have been checked for the proper sizing in accordance with DEQ standards and Prince William approval.

Advanced Drainage Systems will hold a preconstruction meeting in accordance with Loudoun County requirements once delivery of material to the project is made and provide periodic site visits during construction.

Thank you for using ADS.

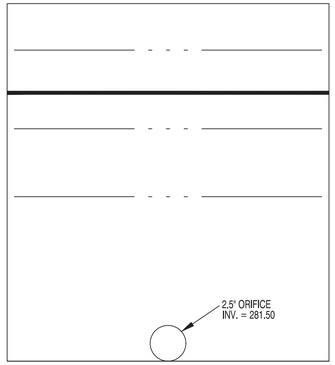
Sincerely,

James M. Clark, P.E.
Sales Engineer

ADVANCED DRAINAGE SYSTEMS, INC., 4640 TRUEMAN BLVD., HILLIARD, OH 43026 PHONE: 800/733-7473
E-mail: *info@ads-pipe.com* Web site: *www. ads-pipe.com*

SWM-A OUTLET DETAIL

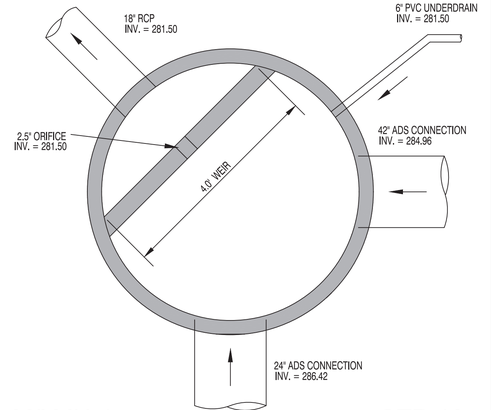
NTS



60" MH-1 STR 12

SWM-A OUTLET DETAIL

NTS



60" MH-1 STR 12

NOTE #1: DETAIL IS FOR INFORMATION PURPOSES ONLY. THE PROFESSIONAL ENGINEER SEAL AND SIGNATURE AFFIXED TO THIS SHEET DOES NOT CERTIFY OR TAKE RESPONSIBILITY FOR THIS DETAIL.

NO.	DATE	DESCRIPTION	BY

DEWBERRY REVISIONS

NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
Lic. No. 047045
8/4/20
PROFESSIONAL ENGINEER

Dewberry
Dewberry Engineers Inc.
13575 HEATHCOTE BLVD.
SUITE 130
GAINESVILLE, VA 20155-6909
PHONE: 703.468.2211
FAX: 703.468.2212

SWM-A DETAILS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale AS SHOWN
Sheet 24 of 41
File Number SP-708

O:\50089161\Wildwood Substation\CAD\Civil\ENGR\Submit\24-29-SWM-DETAIL-ROUTINGS.dwg Aug 04, 2020 - 7:45am
Received by VMRC February 4, 2021 /blh

STORMTECH CHAMBER SPECIFICATIONS

1. CHAMBERS SHALL BE STORMTECH MC-4500.
2. CHAMBERS SHALL BE MANUFACTURED FROM VIRGIN, IMPACT-MODIFIED POLYPROPYLENE COPOLYMERS.
3. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2416-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBER" CHAMBER CLASSIFICATION 60x101.
4. CHAMBER ROWS SHALL PROVIDE CONTINUOUS, UNOBSTRUCTED INTERNAL SPACE WITH NO INTERNAL SUPPORT PANELS THAT WOULD IMPEDE FLOW OR LIMIT ACCESS FOR INSPECTION.
5. THE STRUCTURAL DESIGN OF THE CHAMBERS, THE STRUCTURAL BACKFILL, AND THE INSTALLATION REQUIREMENTS SHALL ENSURE THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET FOR: 1) LONG-DURATION DEAD LOADS AND 2) SHORT-DURATION LIVE LOADS, BASED ON THE AASHTO DESIGN TRUCK WITH CONSIDERATION FOR IMPACT AND MULTIPLE VEHICLE PRESENCES.
6. CHAMBERS SHALL BE DESIGNED, TESTED AND ALLOWABLE LOAD CONFIGURATIONS DETERMINED IN ACCORDANCE WITH ASTM F2787, "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" LOAD CONFIGURATIONS SHALL INCLUDE: 1) INSTANTANEOUS (<1 MIN) AASHTO DESIGN TRUCK LIVE LOAD ON MINIMUM COVER 2) MAXIMUM PERMANENT (75-YR) COVER LOAD AND 3) ALLOWABLE COVER WITH PARKED (1-WEEK) AASHTO DESIGN TRUCK.
7. REQUIREMENTS FOR HANDLING AND INSTALLATION
   a. TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS
   b. TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3"
   c. TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500LBS/IN/IN, AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° / 23° c), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS
8. ONLY CHAMBERS THAT ARE APPROVED BY THE SITE DESIGN ENGINEER WILL BE ALLOWED. THE CHAMBER MANUFACTURER SHALL SUBMIT THE FOLLOWING UPON REQUEST TO THE SITE DESIGN ENGINEER FOR APPROVAL BEFORE DELIVERING CHAMBERS TO THE PROJECT SITE:
   a. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE SAFETY FACTORS ARE GREATER THAN OR EQUAL TO 1.95 FOR DEAD LOAD AND 1.75 FOR LIVE LOAD, THE MINIMUM REQUIRED BY ASTM F2787 AND BY AASHTO FOR THERMOPLASTIC PIPE.
   b. A STRUCTURAL EVALUATION SEALED BY A REGISTERED PROFESSIONAL ENGINEER THAT DEMONSTRATES THAT THE LOAD FACTORS SPECIFIED IN THE AASHTO LRFD BRIDGE DESIGN SPECIFICATIONS, SECTION 12.12, ARE MET. THE 50 YEAR CREEP MODULUS DATA SPECIFIED IN ASTM F2418 MUST BE USED AS PART OF THE AASHTO STRUCTURAL EVALUATION TO VERIFY LONG-TERM PERFORMANCE.
   c. STRUCTURAL CROSS SECTION DETAIL ON WHICH THE STRUCTURAL EVALUATION IS BASED.
9. CHAMBERS AND END CAPS SHALL BE PRODUCED AT AN ISO 9001 CERTIFIED MANUFACTURING FACILITY.

IMPORTANT - NOTES FOR THE BIDDING AND INSTALLATION OF MC-4500 CHAMBER SYSTEM

1. STORMTECH MC-4500 CHAMBERS SHALL NOT BE INSTALLED UNTIL THE MANUFACTURER'S REPRESENTATIVE HAS COMPLETED A PRE-CONSTRUCTION MEETING WITH THE INSTALLERS.
2. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. CHAMBERS ARE NOT TO BE BACKFILLED WITH A DOZER OR EXCAVATOR SITUATED OVER THE CHAMBERS.
4. STORMTECH RECOMMENDS 3 BACKFILL METHODS:
   - STONESHOOTER LOCATED OFF THE CHAMBER BED.
   - BACKFILL AS ROWS ARE BUILT USING AN EXCAVATOR ON THE FOUNDATION STONE OR SUBGRADE.
   - BACKFILL FROM OUTSIDE THE EXCAVATION USING A LONG BOOM HOE OR EXCAVATOR.
5. THE FOUNDATION STONE SHALL BE LEVELED AND COMPACTED PRIOR TO PLACING CHAMBERS.
6. JOINTS BETWEEN CHAMBERS SHALL BE PROPERLY SEATED PRIOR TO PLACING STONE.
7. MAINTAIN MINIMUM 9" (230 mm) SPACING BETWEEN THE CHAMBER ROWS.
8. INLET AND OUTLET MANIFOLDS MUST BE INSERTED A MINIMUM OF 12" (300 mm) INTO CHAMBER END CAPS.
9. EMBEDMENT STONE SURROUNDING CHAMBERS MUST BE A CLEAN, CRUSHED, ANGULAR STONE MEETING THE AASHTO M43 DESIGNATION OF #3 OR #4.
10. STONE SHALL BE BROUGHT UP EVENLY AROUND CHAMBERS SO AS NOT TO DISTORT THE CHAMBER SHAPE. STONE DEPTHS SHOULD NEVER DIFFER BY MORE THAN 12" (300 mm) BETWEEN ADJACENT CHAMBER ROWS.
11. STONE MUST BE PLACED ON THE TOP CENTER OF THE CHAMBER TO ANCHOR THE CHAMBERS IN PLACE AND PRESERVE ROW SPACING.
12. THE CONTRACTOR MUST REPORT ANY DISCREPANCIES WITH CHAMBER FOUNDATION MATERIAL BEARING CAPACITIES TO THE SITE DESIGN ENGINEER.
13. 12. ADS RECOMMENDS THE USE OF "FLEXSTORM CATCH IT" INSERTS DURING CONSTRUCTION FOR ALL INLETS TO PROTECT THE SUBSURFACE STORMWATER MANAGEMENT SYSTEM FROM CONSTRUCTION SITE RUNOFF.

NOTES FOR CONSTRUCTION EQUIPMENT

1. STORMTECH MC-4500 CHAMBERS SHALL BE INSTALLED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
2. THE USE OF EQUIPMENT OVER MC-4500 CHAMBERS IS LIMITED:
   - NO EQUIPMENT IS ALLOWED ON BARE CHAMBERS.
   - NO RUBBER TIRED LOADER, DUMP TRUCK, OR EXCAVATORS ARE ALLOWED UNTIL PROPER FILL DEPTHS ARE REACHED IN ACCORDANCE WITH THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
   - WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT CAN BE FOUND IN THE "STORMTECH MC-3500/MC-4500 CONSTRUCTION GUIDE".
3. FULL 36" (900 mm) OF STABILIZED COVER MATERIALS OVER THE CHAMBERS IS REQUIRED FOR DUMP TRUCK TRAVEL OR DUMPING.

USE OF A DOZER TO PUSH EMBEDMENT STONE BETWEEN THE ROWS OF CHAMBERS MAY CAUSE DAMAGE TO CHAMBERS AND IS NOT AN ACCEPTABLE BACKFILL METHOD. ANY CHAMBERS DAMAGED BY USING THE "DUMP AND PUSH" METHOD ARE NOT COVERED UNDER THE STORMTECH STANDARD WARRANTY.

CONTACT STORMTECH AT 1-888-892-2694 WITH ANY QUESTIONS ON INSTALLATION REQUIREMENTS OR WEIGHT LIMITS FOR CONSTRUCTION EQUIPMENT.

INSPECTION & MAINTENANCE

STEP 1) INSPECT ISOLATOR ROW FOR SEDIMENT
- A. INSPECTION PORTS (IF PRESENT)
  - A.1. REMOVE/OPEN LID ON NYLOPLAST INLINE DRAIN
  - A.2. REMOVE AND CLEAN FLEXSTORM FILTER IF INSTALLED
  - A.3. USING A FLASHLIGHT AND STADIA ROD, MEASURE DEPTH OF SEDIMENT AND RECORD ON MAINTENANCE LOG
  - A.4. LOWER A CAMERA INTO ISOLATOR ROW FOR VISUAL INSPECTION OF SEDIMENT LEVELS (OPTIONAL)
  - A.5. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.
- B. ALL ISOLATOR ROWS
  - B.1. REMOVE COVER FROM STRUCTURE AT UPSTREAM END OF ISOLATOR ROW
  - B.2. USING A FLASHLIGHT, INSPECT DOWN THE ISOLATOR ROW THROUGH OUTLET PIPE
    - i) MIRRORS ON POLES OR CAMERAS MAY BE USED TO AVOID A CONFINED SPACE ENTRY
    - ii) FOLLOW OSHA REGULATIONS FOR CONFINED SPACE ENTRY IF ENTERING MANHOLE
  - B.3. IF SEDIMENT IS AT, OR ABOVE, 3" (80 mm) PROCEED TO STEP 2. IF NOT, PROCEED TO STEP 3.

STEP 2) CLEAN OUT ISOLATOR ROW USING THE JETVAC PROCESS
- A. A FIXED CULVERT CLEANING NOZZLE WITH REAR FACING SPREAD OF 45° (1.1 m) OR MORE IS PREFERRED
- B. APPLY MULTIPLE PASSES OF JETVAC UNTIL BACKFLUSH WATER IS CLEAN
- C. VACUUM STRUCTURE SUMP AS REQUIRED

STEP 3) REPLACE ALL COVERS, GRATES, FILTERS, AND LIDS; RECORD OBSERVATIONS AND ACTIONS.

STEP 4) INSPECT AND CLEAN BASINS AND MANHOLES UPSTREAM OF THE STORMTECH SYSTEM.

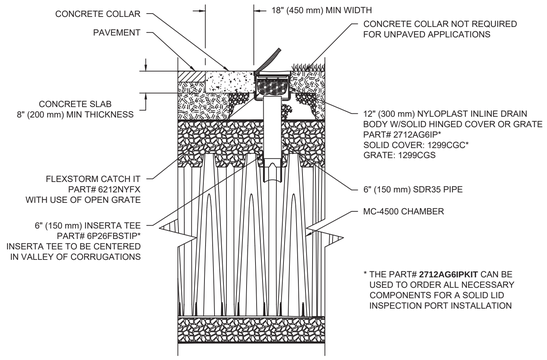
NOTES

1. INSPECT EVERY 6 MONTHS DURING THE FIRST YEAR OF OPERATION. ADJUST THE INSPECTION INTERVAL BASED ON PREVIOUS OBSERVATIONS OF SEDIMENT ACCUMULATION AND HIGH WATER ELEVATIONS.
2. CONDUCT JETTING AND VACTORING ANNUALLY OR WHEN INSPECTION SHOWS THAT MAINTENANCE IS NECESSARY.

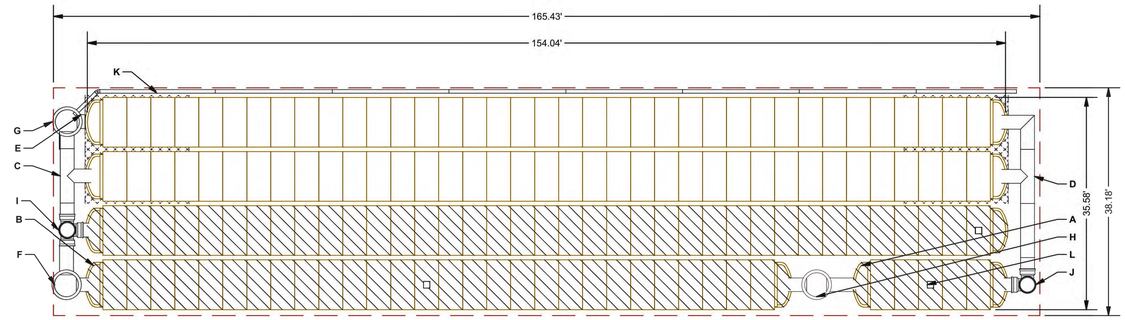
PROPOSED LAYOUT		PROPOSED ELEVATIONS	
144	STORMTECH MC-4500 CHAMBERS	MAXIMUM ALLOWABLE GRADE (TOP OF PAVEMENT/UNPAVED):	296.50
10	STORMTECH MC-4500 END CAPS	MINIMUM ALLOWABLE GRADE (UNPAVED WITH TRAFFIC):	292.00
12	STONE ABOVE (in)	MINIMUM ALLOWABLE GRADE (UNPAVED NO TRAFFIC):	291.50
36	STONE BELOW (in)	MINIMUM ALLOWABLE GRADE (TOP OF RIGID CONCRETE PAVEMENT):	291.50
40	% STONE VOID	MINIMUM ALLOWABLE GRADE (BASE OF FLEXIBLE PAVEMENT):	291.50
32153	INSTALLED SYSTEM VOLUME (CF) (PERIMETER STONE INCLUDED) (COVER STONE INCLUDED) (BASE STONE INCLUDED)	TOP OF STONE:	290.50
		TOP OF MC-4500 CHAMBER:	289.50
		24" x 24" TOP MANIFOLD INVERT:	286.42
		42" BOTTOM CONNECT ON INVERT:	284.96
6317	SYSTEM AREA (SF)	24" ISOLATOR ROW INVERT:	284.69
407.23	SYSTEM PERIMETER (ft)	BOTTOM OF MC-4500 CHAMBER:	284.50
		UNDERDRAIN INVERT:	281.50
		BOTTOM OF STONE:	281.50

*INVERT ABOVE BASE OF CHAMBER

PART TYPE	ITEM ON LAYOUT	DESCRIPTION	INVERT*	MAX FLOW
PREFABRICATED END CAP	A	24" TOP CORED END CAP/TYP OF ALL 24" TOP CONNECTIONS AND ISOLATOR ROWS	23.05"	
PREFABRICATED END CAP	B	24" BOTTOM CORED END CAP/TYP OF ALL 24" BOTTOM CONNECTIONS AND ISOLATOR ROWS	2.26"	
MANIFOLD	C	24" X 24" TOP, ADS N-12	23.05"	
MANIFOLD	D	24" X 24" TOP, ADS N-12	23.05"	
PIPE CONNECTION	E	42" BOTTOM CONNECTION	3.55"	
CONCRETE STRUCTURE	F	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		19.0 CFS IN
CONCRETE STRUCTURE	G	OCS (DESIGN BY ENGINEER / PROVIDED BY OTHERS)		29.0 CFS OUT
CONCRETE STRUCTURE	H	(DESIGN BY ENGINEER / PROVIDED BY OTHERS)		19.0 CFS IN
NYLOPLAST (ACCESS STRUCTURE)	I	30" DIAMETER (24" SUMP MIN)		
NYLOPLAST (ACCESS STRUCTURE)	J	30" DIAMETER (24" SUMP MIN)		
UNDERDRAIN	K	6" ADS N-12 DUAL WALL PERFORATED HDPE UNDERDRAIN		
INSPECTION PORT	L	6" SEE DETAIL (TYP 3 PLACES)		
INSPECTION PORT	L	6" INSPECTION PORT (TYPICAL 3 PLACES)		



MC-4500 6" INSPECTION PORT DETAIL
NTS



ISOLATOR ROW
(SEE DETAIL/TYP 3 PLACES)

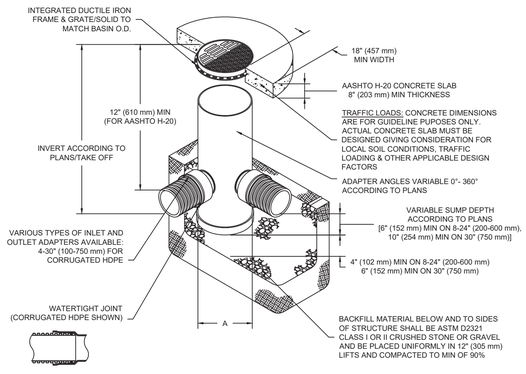
PLACE MINIMUM 17.50' OF ADS GEOSYNTHETICS 315WTM WOVEN GEOTEXTILE OVER BEDDING STONE AND UNDERNEATH CHAMBER FEET FOR SCOUR PROTECTION AT ALL CHAMBER INLET ROWS

BED LIMITS

NOTES

- MANIFOLD SIZE TO BE DETERMINED BY SITE DESIGN ENGINEER. SEE TECH SHEET #7 FOR MANIFOLD SIZING GUIDANCE.
- DUE TO THE ADAPTATION OF THIS CHAMBER SYSTEM TO SPECIFIC SITE AND DESIGN CONSTRAINTS, IT MAY BE NECESSARY TO CUT AND COUPLE ADDITIONAL PIPE TO STANDARD MANIFOLD COMPONENTS IN THE FIELD.
- THE SITE DESIGN ENGINEER MUST REVIEW ELEVATIONS AND IF NECESSARY ADJUST GRADING TO ENSURE THE CHAMBER COVER REQUIREMENTS ARE MET.
- THIS CHAMBER SYSTEM WAS DESIGNED WITHOUT SITE-SPECIFIC INFORMATION ON SOIL CONDITIONS OR BEARING CAPACITY. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR DETERMINING THE SUITABILITY OF THE SOIL AND PROVIDING THE BEARING CAPACITY OF THE INSITU SOILS. THE BASE STONE DEPTH MAY BE INCREASED OR DECREASED ONCE THIS INFORMATION IS PROVIDED.
- THE SITE DESIGN ENGINEER MUST REVIEW THE PROXIMITY OF THE CHAMBERS TO THE SLOPE AND CONSIDER EFFECTS OF POSSIBLE SATURATED SOILS ON THE SLOPE'S INTEGRITY.
- INSPECTION AND MAINTENANCE OF THE SYSTEM VIA THESE STRUCTURES IS RECOMMENDED TO BE COMPLETED WITH REMOTE CONTROLLED EQUIPMENT, OR ADHERE TO GUIDANCE BY A PROFESSIONAL MAINTENANCE COMPANY.

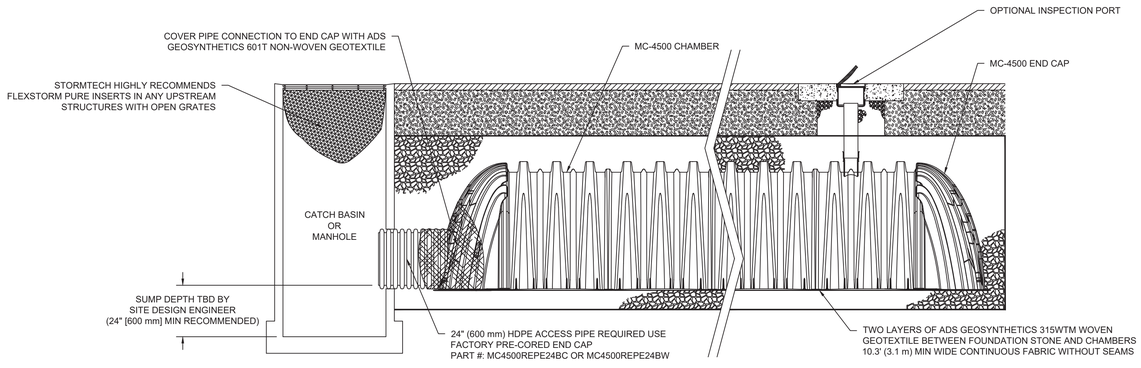
NYLOPLAST DRAIN BASIN
NTS



NOTES

1. 8-30" (200-750 mm) GRATES/SOLID COVERS SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
2. 12-30" (300-750 mm) FRAMES SHALL BE DUCTILE IRON PER ASTM A536 GRADE 70-50-05
3. DRAIN BASIN TO BE CUSTOM MANUFACTURED ACCORDING TO PLAN DETAILS
4. DRAINAGE CONNECTION STUB JOINT TIGHTNESS SHALL CONFORM TO ASTM D3212 FOR CORRUGATED HDPE (ADS & HANCOR DUAL WALL) & SDR 35 PVC
5. FOR COMPLETE DESIGN AND PRODUCT INFORMATION: **WWW.NYLOPLAST-US.COM**
6. TO ORDER CALL: **800-821-6710**

A	PART #	GRATE/SOLID COVER OPTIONS		
8" (200 mm)	2808AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
10" (250 mm)	2810AG	PEDESTRIAN LIGHT DUTY	STANDARD LIGHT DUTY	SOLID LIGHT DUTY
12" (300 mm)	2812AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
15" (375 mm)	2815AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
18" (450 mm)	2818AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
24" (600 mm)	2824AG	PEDESTRIAN AASHTO H-10	STANDARD AASHTO H-20	SOLID AASHTO H-20
30" (750 mm)	2830AG	PEDESTRIAN AASHTO H-20	STANDARD AASHTO H-20	SOLID AASHTO H-20



MC-4500 ISOLATOR ROW DETAIL
NTS

OR APPROVED EQUAL

NO.	DATE	DESCRIPTION	BY
		DEWBERRY REVISIONS	

NO.	DATE	DESCRIPTION	BY
		COUNTY REVISIONS	

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
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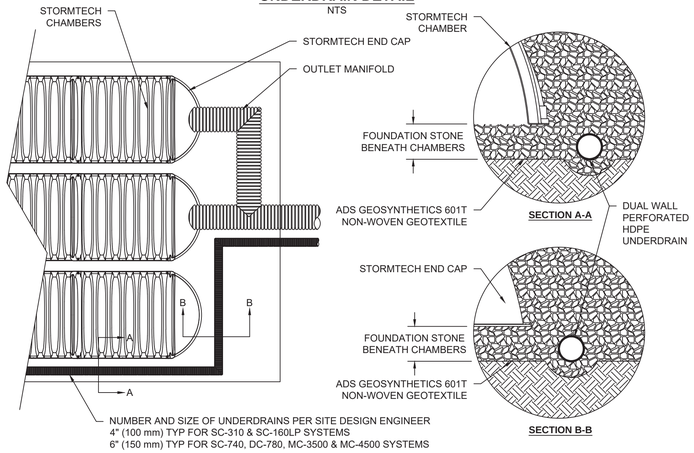
SWM-A DETAILS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale AS SHOWN
Sheet 25 of 41
File Number SP-708

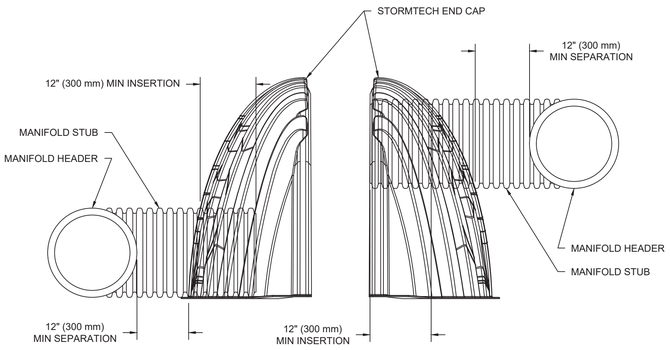
UNDERDRAIN DETAIL

NTS



MC-SERIES END CAP INSERTION DETAIL

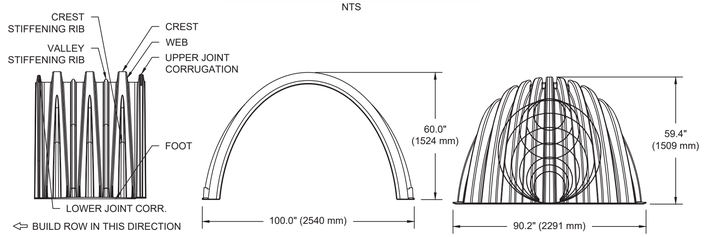
NTS

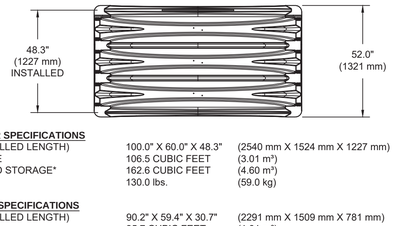


NOTE: MANIFOLD STUB MUST BE LAID HORIZONTAL FOR A PROPER FIT IN END CAP OPENING.

MC-4500 TECHNICAL SPECIFICATION

NTS





NOMINAL CHAMBER SPECIFICATIONS

SIZE (W X H X INSTALLED LENGTH)	100.0" X 60.0" X 48.3"	(2540 mm X 1524 mm X 1227 mm)
CHAMBER STORAGE	106.5 CUBIC FEET	(3.01 m³)
MINIMUM INSTALLED STORAGE*	162.6 CUBIC FEET	(4.60 m³)
WEIGHT	130.0 lbs.	(59.0 kg)

NOMINAL END CAP SPECIFICATIONS

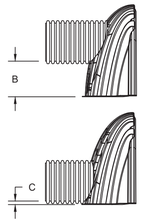
SIZE (W X H X INSTALLED LENGTH)	90.2" X 59.4" X 30.7"	(2291 mm X 1509 mm X 781 mm)
END CAP STORAGE	35.7 CUBIC FEET	(1.01 m³)
MINIMUM INSTALLED STORAGE*	108.7 CUBIC FEET	(3.08 m³)
WEIGHT	135.0 lbs.	(61.2 kg)

*ASSUMES 12" (305 mm) STONE ABOVE, 9" (229 mm) STONE FOUNDATION AND BETWEEN CHAMBERS, 12" (305 mm) STONE PERIMETER IN FRONT OF END CAPS AND 40% STONE POROSITY.

STUBS AT BOTTOM OF END CAP FOR PART NUMBERS ENDING WITH "B"
STUBS AT TOP OF END CAP FOR PART NUMBERS ENDING WITH "T"
END CAPS WITH A WELDED CROWN PLATE END WITH "C"
END CAPS WITH A PREFABRICATED WELDED STUB END WITH "W"

PART #	STUB	B	C
MC4500REPE06T	6" (150 mm)	42.54" (1.081 m)	---
MC4500REPE06B		---	0.86" (22 mm)
MC4500REPE08T	8" (200 mm)	40.50" (1.029 m)	---
MC4500REPE08B		---	1.01" (26 mm)
MC4500REPE10T	10" (250 mm)	38.37" (975 mm)	---
MC4500REPE10B		---	1.33" (34 mm)
MC4500REPE12T	12" (300 mm)	35.69" (907 mm)	---
MC4500REPE12B		---	1.55" (39 mm)
MC4500REPE15T	15" (375 mm)	32.72" (831 mm)	---
MC4500REPE15B		---	1.70" (43 mm)
MC4500REPE18TC	18" (450 mm)	29.36" (746 mm)	---
MC4500REPE18TW			
MC4500REPE18BC		---	1.97" (50 mm)
MC4500REPE18BW			
MC4500REPE24TC	24" (600 mm)	23.05" (585 mm)	---
MC4500REPE24TW			
MC4500REPE24BC		---	2.26" (57 mm)
MC4500REPE24BW			
MC4500REPE30BC	30" (750 mm)	---	2.95" (75 mm)
MC4500REPE36BC	36" (900 mm)	---	3.25" (83 mm)
MC4500REPE42BC	42" (1050 mm)	---	3.55" (90 mm)

NOTE: ALL DIMENSIONS ARE NOMINAL

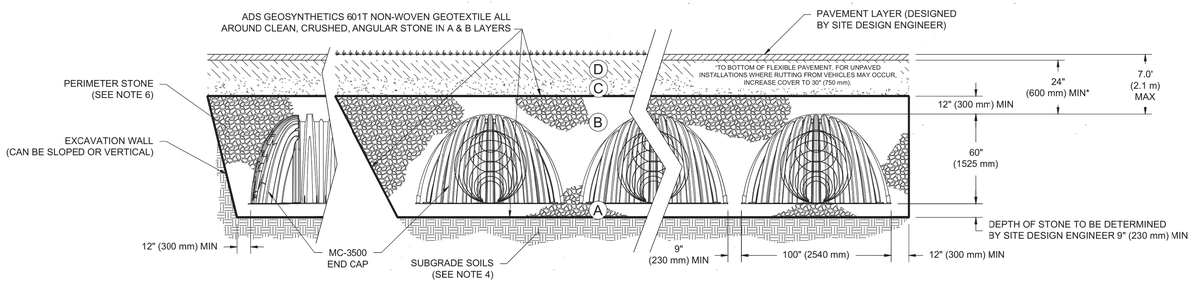


CUSTOM PRECORED INVERTS ARE AVAILABLE UPON REQUEST. INVENTORIED MANIFOLDS INCLUDE 12-24" (300-600 mm) SIZE ON SIZE AND 15-48" (375-1200 mm) ECCENTRIC MANIFOLDS. CUSTOM INVERT LOCATIONS ON THE MC-4500 END CAP CUT IN THE FIELD ARE NOT RECOMMENDED FOR PIPE SIZES GREATER THAN 10" (250 mm). THE INVERT LOCATION IN COLUMN 'B' ARE THE HIGHEST POSSIBLE FOR THE PIPE SIZE.

ACCEPTABLE FILL MATERIALS: STORMTECH MC-4500 CHAMBER SYSTEMS

MATERIAL LOCATION		DESCRIPTION	AASHTO MATERIAL CLASSIFICATIONS	COMPACTION / DENSITY REQUIREMENT
D	**FINAL FILL:** FILL MATERIAL FOR LAYER 'D' STARTS FROM THE TOP OF THE 'C' LAYER TO THE BOTTOM OF FLEXIBLE PAVEMENT OR UNPAVED FINISHED GRADE ABOVE. NOTE THAT PAVEMENT SUBBASE MAY BE PART OF THE 'D' LAYER	ANY SOIL/ROCK MATERIALS, NATIVE SOILS, OR PER ENGINEER'S PLANS. CHECK PLANS FOR PAVEMENT SUBGRADE REQUIREMENTS.	N/A	PREPARE PER SITE DESIGN ENGINEER'S PLANS. PAVED INSTALLATIONS MAY HAVE STRINGENT MATERIAL AND PREPARATION REQUIREMENTS.
C	**INITIAL FILL:** FILL MATERIAL FOR LAYER 'C' STARTS FROM THE TOP OF THE EMBEDMENT STONE ('B' LAYER) TO 24" (600 mm) ABOVE THE TOP OF THE CHAMBER. NOTE THAT PAVEMENT SUBBASE MAY BE A PART OF THE 'C' LAYER.	GRANULAR WELL-GRADED SOIL/AGGREGATE MIXTURES, <35% FINES OR PROCESSED AGGREGATE. MOST PAVEMENT SUBBASE MATERIALS CAN BE USED IN LIEU OF THIS LAYER.	AASHTO M145[1] A-1, A-2-4, A-3 OR AASHTO M43[1] 3, 357, 4, 467, 5, 56, 57, 6, 67, 68, 7, 78, 8, 89, 9, 10	BEGIN COMPACTIONS AFTER 24" (600 mm) OF MATERIAL OVER THE CHAMBERS IS REACHED. COMPACT ADDITIONAL LAYERS IN 12" (300 mm) MAX LIFTS TO A MIN. 95% PROCTOR DENSITY FOR WELL GRADED MATERIAL AND 95% RELATIVE DENSITY FOR PROCESSED AGGREGATE MATERIALS.
B	**EMBEDMENT STONE:** FILL SURROUNDING THE CHAMBERS FROM THE FOUNDATION STONE ('A' LAYER) TO THE 'C' LAYER ABOVE.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	
A	**FOUNDATION STONE:** FILL BELOW CHAMBERS FROM THE SUBGRADE UP TO THE FOOT (BOTTOM) OF THE CHAMBER.	CLEAN, CRUSHED, ANGULAR STONE	AASHTO M43[1] 3, 4	PLATE COMPACT OR ROLL TO ACHIEVE A FLAT SURFACE.[2,3]

PLEASE NOTE:
1. THE LISTED AASHTO DESIGNATIONS ARE FOR GRADATIONS ONLY. THE STONE MUST ALSO BE CLEAN, CRUSHED, ANGULAR. FOR EXAMPLE, A SPECIFICATION FOR #4 STONE WOULD STATE: "CLEAN, CRUSHED, ANGULAR NO. 4 (AASHTO M43) STONE".
2. STORMTECH COMPACTION REQUIREMENTS ARE MET FOR 'A' LOCATION MATERIALS WHEN PLACED AND COMPACTED IN 9" (230 mm) (MAX) LIFTS USING TWO FULL COVERAGES WITH A VIBRATORY COMPACTOR.
3. WHERE INFILTRATION SURFACES MAY BE COMPROMISED BY COMPACTION, FOR STANDARD DESIGN LOAD CONDITIONS, A FLAT SURFACE MAY BE ACHIEVED BY RAKING OR DRAGGING WITHOUT COMPACTION EQUIPMENT. FOR SPECIAL LOAD DESIGNS, CONTACT STORMTECH FOR COMPACTION REQUIREMENTS.
4. ONCE LAYER 'C' IS PLACED, ANY SOIL/MATERIAL CAN BE PLACED IN LAYER 'D' UP TO THE FINISHED GRADE. MOST PAVEMENT SUBBASE SOILS CAN BE USED TO REPLACE THE MATERIAL REQUIREMENTS OF LAYER 'C' OR 'D' AT THE SITE DESIGN ENGINEER'S DISCRETION.



NOTES:

1. CHAMBERS SHALL MEET THE REQUIREMENTS OF ASTM F2418-16a, "STANDARD SPECIFICATION FOR POLYPROPYLENE (PP) CORRUGATED WALL STORMWATER COLLECTION CHAMBERS" CHAMBER CLASSIFICATION 60x101
2. MC-4500 CHAMBERS SHALL BE DESIGNED IN ACCORDANCE WITH ASTM F2787 "STANDARD PRACTICE FOR STRUCTURAL DESIGN OF THERMOPLASTIC CORRUGATED WALL STORMWATER COLLECTION CHAMBERS".
3. THE SITE DESIGN ENGINEER IS RESPONSIBLE FOR ASSESSING THE BEARING RESISTANCE (ALLOWABLE BEARING CAPACITY) OF THE SUBGRADE SOILS AND THE DEPTH OF FOUNDATION STONE WITH CONSIDERATION FOR THE RANGE OF EXPECTED SOIL MOISTURE CONDITIONS.
4. PERIMETER STONE MUST BE EXTENDED HORIZONTALLY TO THE EXCAVATION WALL FOR BOTH VERTICAL AND SLOPED EXCAVATION WALLS.
5. REQUIREMENTS FOR HANDLING AND INSTALLATION:
   - TO MAINTAIN THE WIDTH OF CHAMBERS DURING SHIPPING AND HANDLING, CHAMBERS SHALL HAVE INTEGRAL, INTERLOCKING STACKING LUGS.
   - TO ENSURE A SECURE JOINT DURING INSTALLATION AND BACKFILL, THE HEIGHT OF THE CHAMBER JOINT SHALL NOT BE LESS THAN 3".
   - TO ENSURE THE INTEGRITY OF THE ARCH SHAPE DURING INSTALLATION, a) THE ARCH STIFFNESS CONSTANT AS DEFINED IN SECTION 6.2.8 OF ASTM F2418 SHALL BE GREATER THAN OR EQUAL TO 500 LBS/IN/IN. AND b) TO RESIST CHAMBER DEFORMATION DURING INSTALLATION AT ELEVATED TEMPERATURES (ABOVE 73° F / 23° C), CHAMBERS SHALL BE PRODUCED FROM REFLECTIVE GOLD OR YELLOW COLORS.

OR APPROVED EQUAL

NO.	DATE	DESCRIPTION	BY

DEWBERRY REVISIONS

NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
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SWM-A DETAILS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale AS SHOWN
Sheet 26 of 41
File Number SP-708

Received by VMRC February 4, 2021 /blh

SWM-A VOLUME

Project: **Wildwood Substation**

Chamber Model -	MC-4500	
Units -	Imperial	
Number of Chambers -	144	
Number of End Caps -	10	
Voids in the stone (porosity) -	40	%
Base of STONE Elevation -	281.50	ft
Amount of Stone Above Chambers -	12	in
Amount of Stone Below Chambers -	36	in

StormTech MC-4500 Cumulative Storage Volumes

Height of System (inches)	Incremental Single Chamber (cubic feet)	Incremental Single End Cap (cubic feet)	Incremental Chambers (cubic feet)	Incremental End Cap (cubic feet)	Incremental Stone (cubic feet)	Incremental Ch, EC and Stone (cubic feet)	Cumulative System (cubic feet)	Elevation (feet)
108	0.00	0.00	0.00	0.00	186.26	186.26	29532.11	290.50
107	0.00	0.00	0.00	0.00	186.26	186.26	29345.86	290.42
106	0.00	0.00	0.00	0.00	186.26	186.26	29159.60	290.33
105	0.00	0.00	0.00	0.00	186.26	186.26	28973.34	290.25
104	0.00	0.00	0.00	0.00	186.26	186.26	28787.09	290.17
103	0.00	0.00	0.00	0.00	186.26	186.26	28600.83	290.08
102	0.00	0.00	0.00	0.00	186.26	186.26	28414.57	290.00
101	0.00	0.00	0.00	0.00	186.26	186.26	28228.32	289.92
100	0.00	0.00	0.00	0.00	186.26	186.26	28042.06	289.83
99	0.00	0.00	0.00	0.00	186.26	186.26	27855.80	289.75
98	0.00	0.00	0.00	0.00	186.26	186.26	27669.55	289.67
97	0.00	0.00	0.00	0.00	186.26	186.26	27483.29	289.58
96	0.04	0.00	5.90	0.00	183.90	189.80	27297.04	289.50
95	0.12	0.01	16.72	0.10	179.53	196.35	27107.24	289.42
94	0.16	0.03	23.72	0.26	176.66	200.65	26910.89	289.33
93	0.21	0.05	30.06	0.48	174.04	204.58	26710.24	289.25
92	0.27	0.07	38.64	0.68	170.53	209.85	26505.67	289.17
91	0.45	0.09	65.20	0.88	159.82	225.90	26295.82	289.08
90	0.67	0.11	95.80	1.13	147.49	244.41	26069.92	289.00
89	0.80	0.14	115.06	1.41	139.67	256.14	25825.51	288.92
88	0.91	0.17	130.77	1.68	133.28	265.72	25569.37	288.83
87	1.00	0.19	144.42	1.92	127.72	274.06	25303.64	288.75
86	1.09	0.22	156.58	2.15	122.77	281.49	25029.58	288.67
85	1.16	0.24	167.54	2.41	118.27	288.23	24748.09	288.58
84	1.23	0.27	177.70	2.70	114.10	294.50	24459.86	288.50
83	1.30	0.30	187.15	2.98	110.20	300.33	24165.37	288.42
82	1.36	0.32	195.99	3.23	106.57	305.79	23865.03	288.33
81	1.42	0.35	204.29	3.48	103.15	310.92	23559.24	288.25
80	1.47	0.37	212.16	3.71	99.91	315.78	23248.32	288.17
79	1.53	0.39	219.62	3.94	96.83	320.39	22932.54	288.08
78	1.57	0.42	226.73	4.17	93.90	324.80	22612.15	288.00
77	1.62	0.44	233.48	4.40	91.10	328.99	22287.35	287.92
76	1.67	0.46	239.94	4.63	88.43	332.99	21958.37	287.83
75	1.71	0.48	246.11	4.84	85.88	336.83	21625.37	287.75
74	1.75	0.50	252.01	5.05	83.43	340.49	21288.55	287.67
73	1.79	0.53	257.66	5.25	81.09	344.00	20948.05	287.58
72	1.83	0.55	263.12	5.45	78.83	347.40	20604.05	287.50
71	1.86	0.56	268.34	5.64	76.66	350.64	20256.65	287.42
70	1.90	0.58	273.36	5.83	74.58	353.77	19906.01	287.33
69	1.93	0.60	278.18	6.02	72.58	356.78	19552.24	287.25
68	1.96	0.62	282.83	6.20	70.65	359.67	19195.46	287.17
67	2.00	0.64	287.30	6.38	68.79	362.46	18835.79	287.08
66	2.03	0.66	291.60	6.56	66.99	365.15	18473.32	287.00
65	2.05	0.67	295.75	6.73	65.27	367.74	18108.17	286.92
64	2.08	0.69	299.74	6.90	63.60	370.24	17740.43	286.83
63	2.11	0.71	303.56	7.07	62.00	372.64	17370.19	286.75
62	2.13	0.72	307.27	7.24	60.45	374.96	16997.55	286.67
61	2.16	0.74	310.85	7.40	58.96	377.21	16622.59	286.58
60	2.18	0.76	314.29	7.56	57.52	379.36	16245.38	286.50
59	2.21	0.77	317.60	7.72	56.13	381.44	15866.02	286.42
58	2.23	0.79	320.78	7.87	54.80	383.45	15484.57	286.33
57	2.25	0.80	323.84	8.02	53.51	385.37	15101.13	286.25
56	2.27	0.82	326.79	8.21	52.26	387.25	14715.76	286.17
55	2.29	0.84	329.61	8.41	51.05	389.07	14328.51	286.08
54	2.31	0.85	332.33	8.46	49.94	390.73	13939.44	286.00
53	2.33	0.86	334.94	8.59	48.85	392.37	13548.71	285.92
52	2.34	0.87	337.43	8.72	47.79	393.95	13156.34	285.83
51	2.36	0.89	339.83	8.85	46.79	395.46	12762.39	285.75
50	2.38	0.90	342.11	8.98	45.82	396.91	12366.92	285.67
49	2.39	0.91	344.30	9.10	44.89	398.30	11970.01	285.58
48	2.41	0.92	346.39	9.22	44.01	399.62	11571.71	285.50
47	2.42	0.93	348.37	9.34	43.17	400.89	11172.09	285.42
46	2.43	0.95	350.26	9.46	42.37	402.09	10771.20	285.33
45	2.44	0.96	352.06	9.57	41.61	403.23	10369.11	285.25
44	2.46	0.97	353.76	9.67	40.88	404.31	9965.88	285.17
43	2.47	0.98	355.36	9.78	40.20	405.34	9561.57	285.08
42	2.48	0.99	356.87	9.88	39.56	406.31	9156.23	285.00
41	2.49	1.00	358.31	9.98	38.94	407.23	8749.92	284.92
40	2.50	1.01	359.67	10.07	38.36	408.10	8342.70	284.83
39	2.51	1.02	360.94	10.16	37.82	408.91	7934.60	284.75
38	2.51	1.02	362.12	10.24	37.31	409.67	7525.68	284.67
37	2.53	1.03	363.88	10.33	36.57	410.78	7116.01	284.58
36	0.00	0.00	0.00	0.00	186.26	186.26	6705.23	284.50
35	0.00	0.00	0.00	0.00	186.26	186.26	6518.97	284.42
34	0.00	0.00	0.00	0.00	186.26	186.26	6332.72	284.33
33	0.00	0.00	0.00	0.00	186.26	186.26	6146.46	284.25
32	0.00	0.00	0.00	0.00	186.26	186.26	5960.20	284.17
31	0.00	0.00	0.00	0.00	186.26	186.26	5773.95	284.08
30	0.00	0.00	0.00	0.00	186.26	186.26	5587.69	284.00
29	0.00	0.00	0.00	0.00	186.26	186.26	5401.44	283.92
28	0.00	0.00	0.00	0.00	186.26	186.26	5215.18	283.83
27	0.00	0.00	0.00	0.00	186.26	186.26	5028.92	283.75
26	0.00	0.00	0.00	0.00	186.26	186.26	4842.67	283.67
25	0.00	0.00	0.00	0.00	186.26	186.26	4656.41	283.58
24	0.00	0.00	0.00	0.00	186.26	186.26	4470.15	283.50
23	0.00	0.00	0.00	0.00	186.26	186.26	4283.90	283.42
22	0.00	0.00	0.00	0.00	186.26	186.26	4097.64	283.33
21	0.00	0.00	0.00	0.00	186.26	186.26	3911.38	283.25
20	0.00	0.00	0.00	0.00	186.26	186.26	3725.13	283.17
19	0.00	0.00	0.00	0.00	186.26	186.26	3538.87	283.08
18	0.00	0.00	0.00	0.00	186.26	186.26	3352.62	283.00
17	0.00	0.00	0.00	0.00	186.26	186.26	3166.36	282.92
16	0.00	0.00	0.00	0.00	186.26	186.26	2980.10	282.83
15	0.00	0.00	0.00	0.00	186.26	186.26	2793.85	282.75
14	0.00	0.00	0.00	0.00	186.26	186.26	2607.59	282.67
13	0.00	0.00	0.00	0.00	186.26	186.26	2421.33	282.58
12	0.00	0.00	0.00	0.00	186.26	186.26	2235.08	282.50
11	0.00	0.00	0.00	0.00	186.26	186.26	2048.82	282.42
10	0.00	0.00	0.00	0.00	186.26	186.26	1862.56	282.33
9	0.00	0.00	0.00	0.00	186.26	186.26	1676.31	282.25
8	0.00	0.00	0.00	0.00	186.26	186.26	1490.05	282.17
7	0.00	0.00	0.00	0.00	186.26	186.26	1303.79	282.08
6	0.00	0.00	0.00	0.00	186.26	186.26	1117.54	282.00
5	0.00	0.00	0.00	0.00	186.26	186.26	931.28	281.92
4	0.00	0.00	0.00	0.00	186.26	186.26	745.03	281.83
3	0.00	0.00	0.00	0.00	186.26	186.26	558.77	281.75
2	0.00	0.00	0.00	0.00	186.26	186.26	372.51	281.67
1	0.00	0.00	0.00	0.00	186.26	186.26	186.26	281.58

SWM-A SUMMARY

Subsection: Master Network Summary

Catchments Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Offsite DA	Pre-Development 1	1	6.452	12.300	52.34
Offsite DA	Post-Development 1	1	6.412	12.300	52.03
Offsite DA	Post-Development 2	2	9.558	12.250	82.19
Offsite DA	Pre-Development 2	2	9.619	12.250	82.73
Offsite DA	Pre-Development 10	10	20.757	12.250	189.34
Offsite DA	Post-Development 10	10	20.628	12.250	188.15
Onsite DA	Pre-Development 1	1	0.259	12.050	2.73
Onsite DA	Post-Development 1	1	0.481	11.950	8.41
Onsite DA	Post-Development 2	2	0.708	11.950	12.68
Onsite DA	Pre-Development 2	2	0.465	12.050	6.19
Onsite DA	Pre-Development 10	10	1.279	12.000	20.02
Onsite DA	Post-Development 10	10	1.497	11.950	27.06
Onsite Uncontrolled	Post-Development 1	1	0.236	11.950	4.04
Onsite Uncontrolled	Post-Development 2	2	0.354	11.950	6.28
Onsite Uncontrolled	Post-Development 10	10	0.773	11.950	13.98

Node Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)
Ultimate Outfall	Pre-Development 1	1	6.711	12.300	53.30
Ultimate Outfall	Post-Development 1	1	6.950	12.300	53.02
Ultimate Outfall	Post-Development 2	2	10.275	12.250	83.61
Ultimate Outfall	Pre-Development 2	2	10.084	12.250	84.77
Ultimate Outfall	Pre-Development 10	10	22.036	12.250	194.85
Ultimate Outfall	Post-Development 10	10	22.460	12.250	196.32

Pond Summary

Label	Scenario	Return Event (years)	Hydrograph Volume (ac-ft)	Time to Peak (hours)	Peak Flow (ft³/s)	Maximum Water Surface Elevation (ft)	Maximum Pond Storage (ac-ft)
STORMTECH (IN)	Post-Development 1	1	0.481	11.950	8.41	(N/A)	(N/A)
STORMTECH (OUT)	Post-Development 1	1	0.302	15.450	0.31	285.42	0.256
STORMTECH (IN)	Post-Development 2	2	0.708	11.950	12.68	(N/A)	(N/A)
STORMTECH (OUT)	Post-Development 2	2	0.364	16.000	0.37	286.95	0.419
STORMTECH (IN)	Post-Development 10	10	1.497	11.950	27.06	(N/A)	(N/A)
STORMTECH (OUT)	Post-Development 10	10	1.059	12.050	17.18	288.45	0.558

POST DEVELOPED DISCHARGE

STAGE-DISCHARGE

Subsection: Composite Rating Curve
Label: STM-12
Scenario: Post-Development 1

Return Event: 1 years
Storm Event: 1 Year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
281.50	0.00	(N/A)	0.00
282.00	0.09	(N/A)	0.00
282.50	0.15	(N/A)	0.00
283.00	0.19	(N/A)	0.00
283.50	0.22	(N/A)	0.00
284.00	0.25	(N/A)	0.00
284.50	0.27	(N/A)	0.00
285.00	0.29	(N/A)	0.00
285.50	0.32	(N/A)	0.00
286.00	0.34	(N/A)	0.00
286.50	0.35	(N/A)	0.00
287.00	0.37	(N/A)	0.00
287.20	0.38	(N/A)	0.00
287.50	2.34	(N/A)	0.00
288.00	8.93	(N/A)	0.00
288.50	18.04	(N/A)	0.00
289.00	23.73	(N/A)	0.00
289.50	25.45	(N/A)	0.00
290.00	26.71	(N/A)	0.00

Subsection: Composite Rating Curve
Label: STM-12
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 2 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
281.50	0.00	(N/A)	0.00
282.00	0.09	(N/A)	0.00
282.50	0.15	(N/A)	0.00
283.00	0.19	(N/A)	0.00
283.50	0.22	(N/A)	0.00
284.00	0.25	(N/A)	0.00
284.50	0.27	(N/A)	0.00
285.00	0.29	(N/A)	0.00
285.50	0.32	(N/A)	0.00
286.00	0.34	(N/A)	0.00
286.50	0.35	(N/A)	0.00
287.00	0.37	(N/A)	0.00
287.20	0.38	(N/A)	0.00
287.50	2.34	(N/A)	0.00
288.00	8.93	(N/A)	0.00
288.50	18.04	(N/A)	0.00
289.00	23.73	(N/A)	0.00
289.50	25.45	(N/A)	0.00
290.00	26.71	(N/A)	0.00

Subsection: Composite Rating Curve
Label: STM-12
Scenario: Post-Development 10

Return Event: 10 years
Storm Event: 10 year

Composite Outflow Summary

Water Surface Elevation (ft)	Flow (ft³/s)	Tailwater Elevation (ft)	Convergence Error (ft)
281.50	0.00	(N/A)	0.00
282.00	0.09	(N/A)	0.00
282.50	0.15	(N/A)	0.00
283.00	0.19	(N/A)	0.00
283.50	0.22	(N/A)	0.00
284.00	0.25	(N/A)	0.00
284.50	0.27	(N/A)	0.00
285.00	0.29	(N/A)	0.00
285.50	0.32	(N/A)	0.00
286.00	0.34	(N/A)	0.00
286.50	0.35	(N/A)	0.00
287.00	0.37	(N/A)	0.00
287.20	0.38	(N/A)	0.00
287.50	2.34	(N/A)	0.00
288.00	8.93	(N/A)	0.00
288.50	18.04	(N/A)	0.00
289.00	23.73	(N/A)	0.00
289.50	25.45	(N/A)	0.00
290.00	26.71	(N/A)	0.00

SWM-A INPUT DATA

Subsection: Outlet Input Data
Label: STM-12
Scenario: Post-Development 1

Return Event: 1 years
Storm Event: 1 Year

Requested Pond Water Surface Elevations	
Minimum (Headwater)	281.50 ft
Increment (Headwater)	0.50 ft
Maximum (Headwater)	290.00 ft

Outlet Connectivity

Structure Type	Outlet ID	Direction	Outfall	E1 (ft)	E2 (ft)
Orifice-Circular	Orifice - 1	Forward	STM12-11	281.50	290.50
Rectangular Weir	Weir - 1	Forward	STM12-11	287.20	290.50
Culvert-Circular	STM12-11	Forward	TW	281.50	290.50
Tailwater Settings	Tailwater			(N/A)	(N/A)

Structure ID: Orifice - 1
Structure Type: Orifice-Circular

Number of Openings	1
Elevation	281.50 ft
Orifice Diameter	2.5 in
Orifice Coefficient	0.600

Structure ID: Weir - 1
Structure Type: Rectangular Weir

Number of Openings	1
Elevation	287.20 ft
Weir Length	4.00 ft
Weir Coefficient	3.00 (ft^0.5)/s

Structure ID: STM12-11
Structure Type: Culvert-Circular

Number of Barrels	1
Diameter	18.0 in
Length	15.00 ft
Length (Computed Barrel)	15.03 ft
Slope (Computed)	0.067 ft/ft

Outlet Control Data	
Manning's n	0.013
Ke	0.200
Kb	0.018
Kr	0.000
Convergence Tolerance	0.00 ft

Inlet Control Data	
Equation Form	Form 1
K	0.0045
M	2.0000
C	0.0317
Y	0.6900
T1 ratio (HW/D)	1.062
T2 ratio (HW/D)	1.164
Slope Correction Factor	-0.500

Structure ID: TW
Structure Type: TW Setup, DS Channel

Tailwater Type	Free Outfall

Convergence Tolerances	
Maximum Iterations	30
Tailwater Tolerance (Minimum)	0.01 ft
Tailwater Tolerance (Maximum)	0.50 ft
Headwater Tolerance (Minimum)	0.01 ft
Headwater Tolerance (Maximum)	0.50 ft
Flow Tolerance (Minimum)	0.001 ft³/s
Flow Tolerance (Maximum)	10.000 ft³/s

Use unsubmerged inlet control 0 equation below T1 elevation.
Use submerged inlet control 0 equation above T2 elevation

In transition zone between unsubmerged and submerged inlet control, interpolate between flows at T1 & T2...

T1 Elevation	283.09 ft	T1 Flow	7.58 ft³/s
T2 Elevation	283.25 ft	T2 Flow	8.66 ft³/s

NO.	DATE	DESCRIPTION	BY

DEWBERRY REVISIONS

NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
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SWM-A COMPUTATIONS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale
Sheet 27 of 41
File Number SP-708

ROUTING SUMMARY

Subsection: Elevation-Volume-Flow Table (Pond)
Label: STORMTECH
Scenario: Post-Development 1

Return Event: 1 years
Storm Event: 1 Year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	281.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
281.50	0.00	0.000	0.000	0.00	0.00	0.00
282.00	0.09	0.026	0.000	0.00	0.09	12.53
282.50	0.15	0.051	0.000	0.00	0.15	24.98
283.00	0.19	0.077	0.000	0.00	0.19	37.45
283.50	0.22	0.103	0.000	0.00	0.22	49.88
284.00	0.25	0.128	0.000	0.00	0.25	62.34
284.50	0.27	0.154	0.000	0.00	0.27	74.76
285.00	0.29	0.210	0.000	0.00	0.29	102.03
285.50	0.32	0.266	0.000	0.00	0.32	128.87
286.00	0.34	0.320	0.000	0.00	0.34	155.22
286.50	0.35	0.373	0.000	0.00	0.35	180.84
287.00	0.37	0.424	0.000	0.00	0.37	205.64
287.20	0.38	0.444	0.000	0.00	0.38	215.17
287.50	2.34	0.473	0.000	0.00	2.34	231.28
288.00	8.93	0.519	0.000	0.00	8.93	260.18
288.50	18.04	0.561	0.000	0.00	18.04	289.81
289.00	23.73	0.598	0.000	0.00	23.73	313.41
289.50	25.45	0.627	0.000	0.00	25.45	328.77
290.00	26.71	0.652	0.000	0.00	26.71	342.42
290.50	27.77	0.678	0.000	0.00	27.77	355.92

Subsection: Elevation-Volume-Flow Table (Pond)
Label: STORMTECH
Scenario: Post-Development 2

Return Event: 2 years
Storm Event: 2 year

Infiltration	
Infiltration Method (Computed)	No Infiltration

Initial Conditions	
Elevation (Water Surface, Initial)	281.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
281.50	0.00	0.000	0.000	0.00	0.00	0.00
282.00	0.09	0.026	0.000	0.00	0.09	12.53
282.50	0.15	0.051	0.000	0.00	0.15	24.98
283.00	0.19	0.077	0.000	0.00	0.19	37.45
283.50	0.22	0.103	0.000	0.00	0.22	49.88
284.00	0.25	0.128	0.000	0.00	0.25	62.34
284.50	0.27	0.154	0.000	0.00	0.27	74.76
285.00	0.29	0.210	0.000	0.00	0.29	102.03
285.50	0.32	0.266	0.000	0.00	0.32	128.87
286.00	0.34	0.320	0.000	0.00	0.34	155.22
286.50	0.35	0.373	0.000	0.00	0.35	180.84
287.00	0.37	0.424	0.000	0.00	0.37	205.64
287.20	0.38	0.444	0.000	0.00	0.38	215.17
287.50	2.34	0.473	0.000	0.00	2.34	231.28
288.00	8.93	0.519	0.000	0.00	8.93	260.18
288.50	18.04	0.561	0.000	0.00	18.04	289.81
289.00	23.73	0.598	0.000	0.00	23.73	313.41
289.50	25.45	0.627	0.000	0.00	25.45	328.77
290.00	26.71	0.652	0.000	0.00	26.71	342.42
290.50	27.77	0.678	0.000	0.00	27.77	355.92

Subsection: Elevation-Volume-Flow Table (Pond)
Label: STORMTECH
Scenario: Post-Development 10

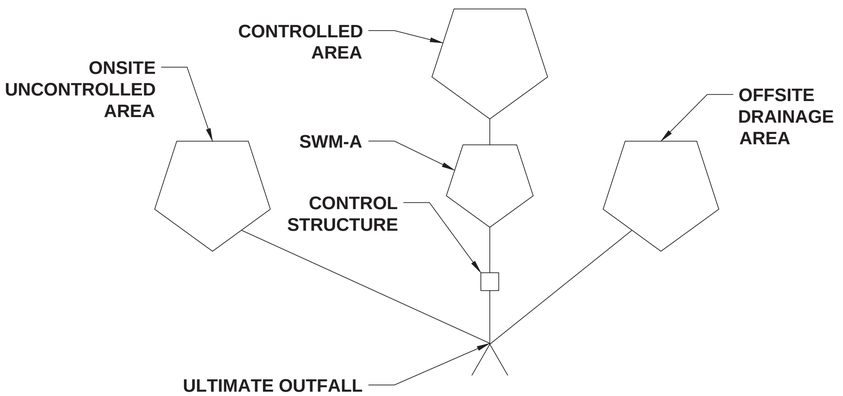
Return Event: 10 years
Storm Event: 10 year

Infiltration	
Infiltration Method (Computed)	No Infiltration

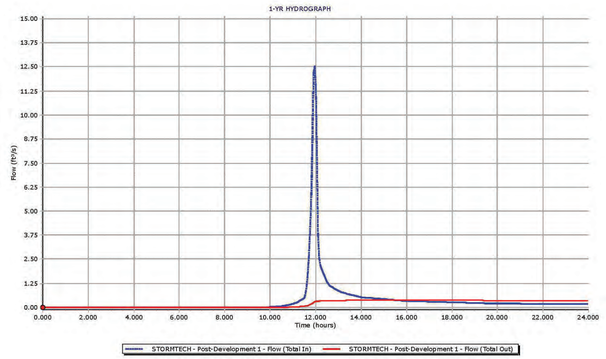
Initial Conditions	
Elevation (Water Surface, Initial)	281.50 ft
Volume (Initial)	0.000 ac-ft
Flow (Initial Outlet)	0.00 ft³/s
Flow (Initial Infiltration)	0.00 ft³/s
Flow (Initial, Total)	0.00 ft³/s
Time Increment	0.050 hours

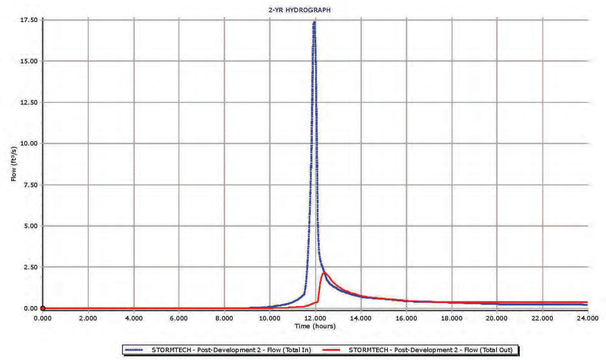
Elevation (ft)	Outflow (ft³/s)	Storage (ac-ft)	Area (acres)	Infiltration (ft³/s)	Flow (Total) (ft³/s)	2S/t + O (ft³/s)
281.50	0.00	0.000	0.000	0.00	0.00	0.00
282.00	0.09	0.026	0.000	0.00	0.09	12.53
282.50	0.15	0.051	0.000	0.00	0.15	24.98
283.00	0.19	0.077	0.000	0.00	0.19	37.45
283.50	0.22	0.103	0.000	0.00	0.22	49.88
284.00	0.25	0.128	0.000	0.00	0.25	62.34
284.50	0.27	0.154	0.000	0.00	0.27	74.76
285.00	0.29	0.210	0.000	0.00	0.29	102.03
285.50	0.32	0.266	0.000	0.00	0.32	128.87
286.00	0.34	0.320	0.000	0.00	0.34	155.22
286.50	0.35	0.373	0.000	0.00	0.35	180.84
287.00	0.37	0.424	0.000	0.00	0.37	205.64
287.20	0.38	0.444	0.000	0.00	0.38	215.17
287.50	2.34	0.473	0.000	0.00	2.34	231.28
288.00	8.93	0.519	0.000	0.00	8.93	260.18
288.50	18.04	0.561	0.000	0.00	18.04	289.81
289.00	23.73	0.598	0.000	0.00	23.73	313.41
289.50	25.45	0.627	0.000	0.00	25.45	328.77
290.00	26.71	0.652	0.000	0.00	26.71	342.42
290.50	27.77	0.678	0.000	0.00	27.77	355.92

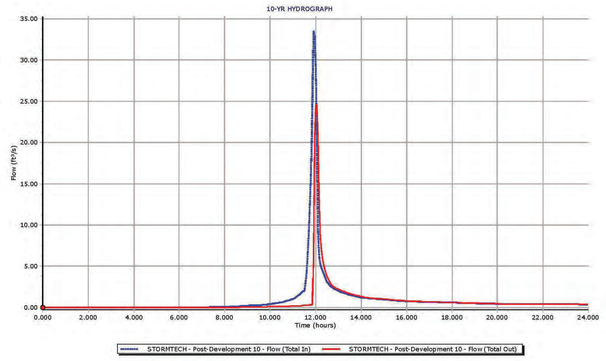
SWM-A TO ULITMATE OUTFALL ROUTING DIAGRAM



HYDROGRAPH







CONTROLLED CN TO SWM-A

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Open Space - Good Condition	B	61	0.49	29.89
2.	Gravel	B	85	4.69	398.65
3.	Forest	C	70	0.05	3.50
4.	Open Space - Good Condition	C	74	1.39	102.86
5.	Gravel	C	89	1.25	111.25
6.	Open Space - Good Condition	D	80	0.07	5.60
7.	Gravel	D	91	0.17	15.47
			Totals =	8.11	667.22

C (Weighted) = Total Product / Total Area = 667.22 / 8.11 = **82.27**

OFFSITE CN

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Forest	B	55	16.89	928.95
2.	Open Space - Good Condition	B	61	9.49	578.89
3.	Pavement	B	98	1.32	129.36
4.	Forest	C	70	1.09	76.30
5.	Open Space - Good Condition	C	74	2.80	207.20
6.	Pavement	C	98	0.22	21.56
7.	Forest	D	77	40.05	3083.85
8.	Open Space - Good Condition	D	80	38.65	3092.00
9.	Pavement	D	98	6.83	669.34
			Totals =	117.34	8787.45

C (Weighted) = Total Product / Total Area = 8787.45 / 117.34 = **74.89**

ONSITE UNCONTROLLED CN

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Open Space - Good Condition	B	61	1.64	100.04
2.	Gravel	B	85	0.31	26.35
3.	Open Space - Good Condition	C	74	0.20	14.80
4.	Gravel	C	89	0.04	3.56
5.	Open Space - Good Condition	D	80	1.89	151.20
6.	Gravel	D	91	0.40	36.40
			Totals =	4.48	332.35

C (Weighted) = Total Product / Total Area = 332.35 / 4.48 = **74.19**

NO.	DATE	DESCRIPTION	BY

DEWBERRY REVISIONS

NO.	DATE	DESCRIPTION	BY

COUNTY REVISIONS

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
Lic. No. 047045
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SWM-A COMPUTATIONS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale
Sheet 28 of 41
File Number SP-708

OFFSITE CN

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Forest	B	55	16.89	928.95
2.	Open Space - Good Condition	B	61	9.49	578.89
3.	Pavement	B	98	1.32	129.36
4.	Forest	C	70	1.14	79.80
5.	Open Space - Good Condition	C	74	3.56	263.44
6.	Pavement	C	98	0.22	21.56
7.	Forest	D	77	40.05	3083.85
8.	Open Space - Good Condition	D	80	38.65	3092.00
9.	Pavement	D	98	6.83	669.34
			Totals =	118.15	8847.19

C (Weighted) = Total Product / Total Area = 8847.19 / 118.15 = **74.88**

ON-SITE EXISTING CN TO OUTFALL 1

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Forest	B	55	6.29	345.95
2.	Open Space - Good Condition	B	61	0.76	46.36
3.	Gravel	B	85	0.11	9.35
4.	Forest	C	70	1.35	94.50
5.	Open Space - Good Condition	C	74	0.59	43.66
6.	Gravel	C	89	0.07	6.23
7.	Forest	D	77	1.97	151.69
8.	Open Space - Good Condition	D	80	0.42	33.60
9.	Gravel	D	91	0.10	9.10
			Totals =	11.66	740.44

C (Weighted) = Total Product / Total Area = 740.44 / 11.66 = **63.50**

ON-SITE PROPOSED CN TO OUTFALL 1

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Forest	B	55	0.00	0.00
2.	Open Space - Good Condition	B	61	2.13	129.93
3.	Gravel	B	85	5.00	425.00
4.	Forest	C	70	0.00	0.00
5.	Open Space - Good Condition	C	74	0.71	52.54
6.	Gravel	C	89	1.29	114.81
7.	Forest	D	77	0.00	0.00
8.	Open Space - Good Condition	D	80	1.96	156.80
9.	Gravel	D	91	0.57	51.87
			Totals =	11.66	930.95

C (Weighted) = Total Product / Total Area = 930.95 / 11.66 = **79.84**

FORESTED CN

	Description of Area	Soil Type	CN value	Area(A) (ac)	CN x A
1.	Forest	B	55	7.16	393.80
2.	Forest	C	70	2.01	140.70
3.	Forest	D	77	2.49	191.73
			Totals =	11.66	726.23

C (Weighted) = Total Product / Total Area = 726.23 / 11.66 = **62.28**

OUTFALL 1 ANALYSIS

Loudoun County
Dewberry
Site-Civil Engineering

Channel Type: **Natural** Checker: **JH**

STEP 1: Determine the Pre Developed, Forested, and Post Developed Conditions within the disturbed area and the offsite area draining to project BMPs.

Pre Developed Conditions		Forested Conditions		Post Developed Conditions		Offsite Conditions	Pre Developed	Post Developed
Weighted CN =	63.5	**Weighted CN =**	62.3	**Weighted CN =**	79.8	**Weighted CN =**	74.9	74.9
Area (ac) =	11.66	**Area (ac) =**	11.66	**Area (ac) =**	11.66	**Area (ac) =**	118.15	118.15
P (in.) =	2.53	**P (in.) =**	2.53	**P (in.) =**	2.53	**P (in.) =**	2.53	2.53

STEP 2: Determine the peak discharge for each area. The total predevelopment discharge combines offsite and pre developed conditions.

Pre Developed Discharge		Forested Conditions Discharge		Post Development Discharge		Offsite Conditions Discharge	
S	5.7	S	6.1	S	2.5	S	3.4
Ia	1.1	Ia	1.2	Ia	0.5	Ia	0.7
Q (in)	0.3 in	Q (in)	0.2 in	Q (in)	0.9 in	Q (in)	0.7
Volume	0.260 ac-ft	Volume	0.229 ac-ft	Volume	0.876 ac-ft	Volume (ac-ft)	6.527

Onsite Forested Discharge (From PondPack)	**2.32** cfs	**Onsite Pre-development Discharge** (From PondPack)	**2.73** cfs	**Offsite Pre- development Discharge** (From PondPack)	**52.34**	**Total Pre-development Discharge** (From PondPack)	**53.30** cfs

STEP 3: Calculate Adjusted CN value using Runoff Reduction provided in BMPs

Post Development - CN Adjustement	
S	3.1
Ia	0.6
Q (in)	0.7 in
Volume	0.709 ac-ft

BMP	Runoff Reduction
Bioretention	**7273** ft³
	ft³
	ft³
	ft³
	ft³
Total =	**7273** ft³

Qpost without RR = 0.9
Qpost with RR = 0.7
Adjusted CN = 76

STEP 4: Calculate $Q_{rgowage}$ using the energy balance equation. Only apply the improvement factor to the disturbed area.

Energy Balance Equation: $Q_{Developed} \leq I.F.x(Q_{Pre\text{-}Developed} \times RV_{Pre\text{-}Developed}) / RV_{Developed}$
Improvement Factor 0.8

$Q_{rgowage} \leq$ [Total Predevelopment Discharge [(Improvement Factor x Pre-Developed Volume) / (Post-Development Volume)]] + Offsite Predevleopment Discharge]
$Q_{rgowage}$ 53.14 cfs

STEP 5: Calculated Maximum Allowable Peak Discharge.

Maximum Allowable Peak Discharge = Maximum (Q_{yoreq} or $Q_{rgowage}$)

Q_{yoreq} = [Total Forest Peak Discharge x (Forest Volume + Offsite Volume)/(Post-Development Volume] + Offsite Volume
Q_{yoreq} 53.09 cfs

Maximum Allowable Peak Discharge **53.14** cfs

STEP 6: Ensure $Q_{pre\text{-}development}$ is less than the Maximum Allowable Peak Discharge

$Q_{pre\text{-}development}$ (from Pond Pack) **53.02** cfs

Channel is Adequate

ADEQUATE OUTFALL NARRATIVE

THE PREDEVELOPMENT CONDITIONS FOR OUTFALL ONE CONSISTS OF SHEET FLOW THE ENTERS STREAMS THAT ARE LOCATED ON SITE BEFORE CONVERGING INTO ONE STREAM AND EXITING THE SITE. THE POST DEVELOPMENT DRAINAGE AREA TO OUTFALL ONE CONSISTS OF CONTROLLED CONCENTRATED FLOW AS WELL AS UNCONTROLLED FLOW THAT ENTER THE ONSITE NATURAL STREAMS AND LEAVE THE SITE AS STREAM FLOW. BECAUSE OF THE CONCENTRATED FLOWS, AN ADEQUATE OUTFALL ANALYSIS WAS PERFORMED. AS DISCUSSED WITH LOUDOUN COUNTY PRIOR TO THIS SUBMISSION, A SINGULAR POINT OF INTEREST WAS CHOSEN IN THIS ANALYSIS THAT WOULD INCLUDE ALL CONCENTRATED FLOWS LEAVING THE SITE. CHANNEL PROTECTION AND FLOOD PROTECTION ARE TO BE MET AT THIS SINGULAR POINT IN ORDER TO DETERMINE IF ADEQUACY HAS BEEN MET FOR THE PROPOSED DEVELOPMENT.

CHANNEL PROTECTION ANALYSIS WAS PERFORMED USING A CONJUNCTION OF ANALYZING THE 2 YEAR VELOCITY WITHIN THE STREAMS AS WELL AS MEETING THE ENERGY BALANCE CRITERIA AT THE POINT OF INTEREST. DITCH COMPUTATIONS AND CROSS SECTIONS HAVE BEEN PROVIDED ON SHEET 16-17 WHICH SHOWS THE 2 YEAR VELOCITY THROUGH OUT THE STREAMS AND PROPOSED DITCHES WHICH INCLUDES THE FLOW FROM THE OUTFALL OF THE STORMTECH SYSTEM. IT HAS BEEN DETERMINED THAT THE VELOCITIES WITHIN THE STREAMS AND DITCHES ARE LESS THEN 4 FPS AND DEEMED NON EROSIVE TO THE POINT OF INTEREST.

ONCE THE FLOWS WERE DETERMINED TO BE NON EROSIVE, THE ENERGY BALANCE EQUATION WAS PERFORMED AT THE POINT OF INTEREST. THE PREDEVELOPMENT FLOW TO THE POINT OF INTEREST IS 53.30 CFS. THE MAXIMUM ALLOWABLE FLOW THAT WOULD NEED TO BE ACHIEVED IN ORDER TO MEET THE CHANNEL PROTECTION CRITERIA WAS DETERMINED TO BE 53.14 CFS, SEE ABOVE COMPUTATIONS. IN ORDER TO SHOW THE BIORETENTION'S RUNOFF REDUCTION, A "CN" ADJUSTMENT WAS CALCULATED USING THE RUNOFF REDUCTION VOLUME, SEE THIS SHEET. A MODEL WAS THEN CREATED WITHIN POND PACK THAT UTILIZED THE SCS METHOD WHICH HAS THE ONSITE AREA CONTROLLED, ONSITE AREA UNCONTROLLED, AND THE OFFSITE AREA FLOWING TO THE POINT OF INTEREST. THE POST DEVELOPMENT RUNOFF WAS THEN CALCULATED TO BE 53.02 CFS. BECAUSE POST DEVELOPMENT FLOW OF 53.02 CFS IS LESS THAN THE MAXIMUM ALLOWABLE FLOW OF 53.14 CFS, IT IS HAS BEEN DETERMINED THAT THIS OUTFALL MEETS CHANNEL PROTECTION FOR THE NATURAL STORMWATER CONVEYANCE SYSTEM CRITERIA.

FLOOD PROTECTION ANALYSIS WAS PERFORMED UP TO THE POINT OF INTEREST AS THIS POINT IS WITHIN THE 100 YR FLOOD PLAIN. DITCH COMPUTATIONS HAVE BEEN PERFORMED PER THIS PLAN, SEE SHEET 16, TO SHOW THE 10 YR STORM EVENT BEING CONVEYED THROUGH THE DITCHES AND STREAMS WITHOUT OVERTOPPING. BECAUSE THE STREAMS AND PROPOSED DITCHES CONVEY THE 10 YEAR STORM FOR THE PROPOSED CONDITIONS TO THE FLOODPLAIN, IT HAS BEEN DETERMINED THAT THIS SITE MEETS THE FLOOD PROTECTION CRITERIA AND NO FURTHER ANALYSIS IS REQUIRED.

NO.	DATE	DESCRIPTION	BY
		DEWBERRY REVISIONS	

NO.	DATE	DESCRIPTION	BY
		COUNTY REVISIONS	

COMMONWEALTH OF VIRGINIA
CURT R. CROUCH
Lic. No. 047045
8/4/20
PROFESSIONAL ENGINEER

Dewberry
Dewberry Engineers Inc.
13775 HEATHCOTE BLVD.
SUITE 150
GAINESVILLE, VA 20155-6809
PHONE: 703.468.2211
FAX: 703.468.2212

ADEQUATE OUTFALL ANALYSIS

NOVEC
WILDWOOD SUBSTATION
Catoctin Election District
Loudoun County, Virginia

Plan Number STPL-2019-0051
Drawn By JH
Designed By JH
Checked By
Date 11/26/2019
Scale N/A
Sheet 29 Of 41
File Number SP-708

APPENDIX D – WETLAND DELINEATION

Received by VMRC February 4, 2021 /blh

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

April 8, 2019

PRELIMINARY JURISDICTIONAL DETERMINATION

Northern Virginia Regulatory Section
NAO-2019-00325 (Goose Creek)

Northern Virginia Electric Cooperative (NOVEC)
c/o Mr. George Coutts
5399 Wellington Branch Drive
Gainesville, Virginia 20155

Dear Mr. Coutts:

This letter is in regard to your request for a preliminary jurisdictional determination for waters of the U.S. (including wetlands) on property known as Wildwood Substation, an approximately 27.60-acre site situated northeast of Sycolin Road (Route 643), south of the Dulles Greenway (Route 267), and west of Belmon Ridge Road (Route 659) in Loudoun County, Virginia (39.046837, -77.540974).

The map titled "NOVEC Wildwood Substation," by Stantec, date stamped as received by the Corps February 22, 2019 (copy enclosed), provides the location/s of waters of the U.S. (WOUS) on the property listed above. The basis for this determination is the application of the Corps' 1987, Wetland Delineation Manual and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region. **Note: This letter is not confirming the Cowardin classifications of the WOUS.**

Discharges of dredged or fill material into WOUS on this site will require a Department of the Army permit and may require authorization by state and local authorities, including a Virginia Water Protection Permit from the Virginia Department of Environmental Quality (DEQ), a permit from the Virginia Marine Resources Commission (VMRC) and/or a permit from your local wetlands board. This letter is a confirmation of the Corps jurisdiction for the WOUS on the subject property and does not authorize any work in these jurisdictional areas. Please obtain all required permits before starting work in the delineated WOUS.

This is a preliminary jurisdictional determination and is therefore not a legally binding determination regarding whether Corps jurisdiction applies to the waters/wetlands in question. Accordingly, you may either consent to jurisdiction as set out in this preliminary jurisdictional determination and the attachments hereto if you agree with the determination, or you may request and obtain an approved jurisdictional determination.

Enclosed is a copy of the "Preliminary Jurisdictional Determination Form". Please review the document, sign, and return one copy to me via email (brittany.n.dunn@usace.army.mil). **This delineation of waters/wetlands is valid for a period of no more than five years from the date of this letter. If new information warrants, revisions prior to the expiration date may be required.**

If you have any questions, please contact me either via telephone at (757) 201-7029 or via email at (brittany.n.dunn@usace.army.mil).

Sincerely,

DUNN.BRITTANY.N.1513285520

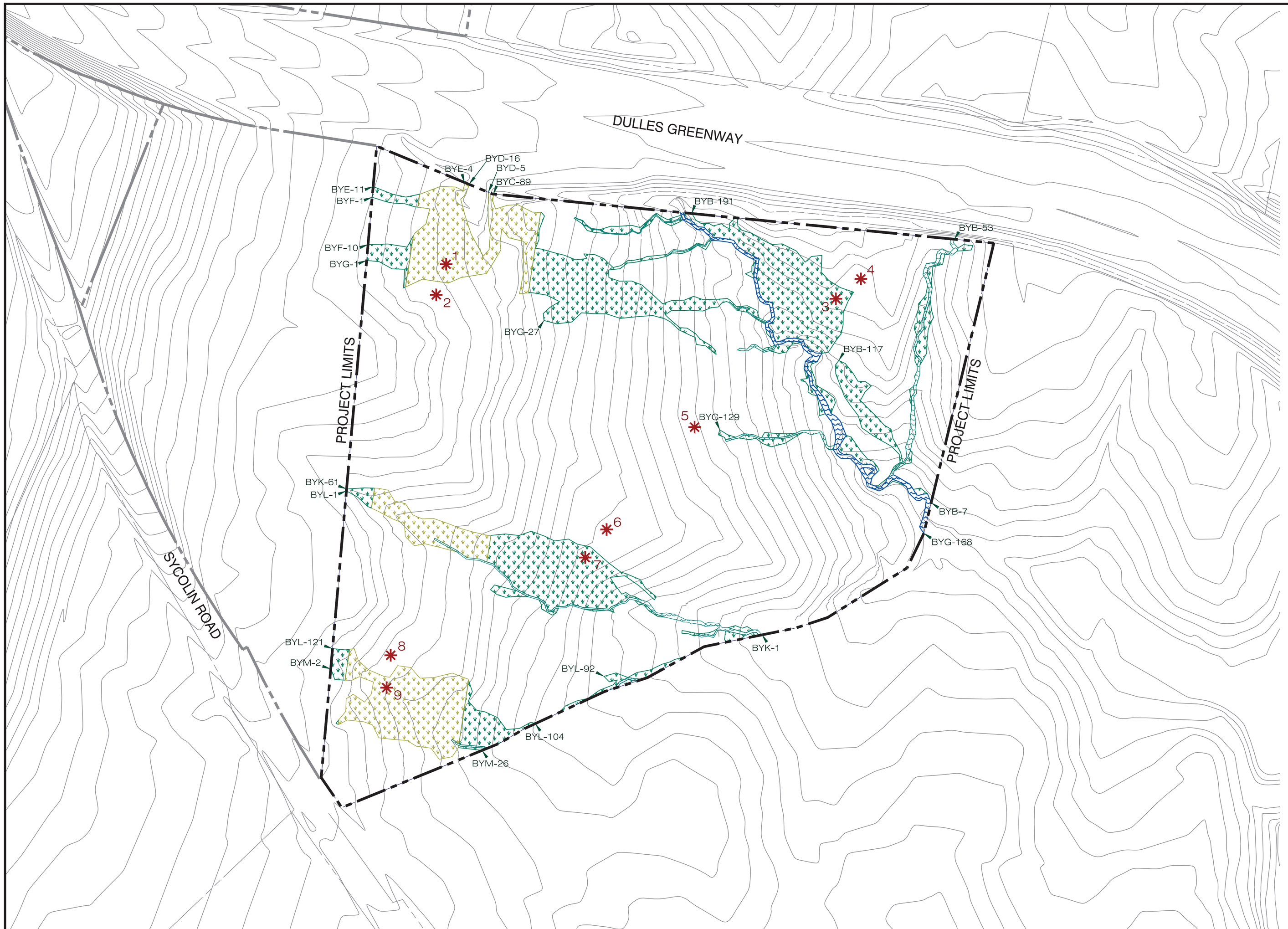
Digitally signed by DUNN.BRITTANY.N.1513285520
DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=DUNN.BRITTANY.N.1513285520
Date: 2019.04.07 17:51:14 -04'00'

Brittany N. Dunn
Environmental Scientist
Northern Virginia Regulatory Section

Enclosures:
(1) "NOVEC Wildwood Substation" Delineation Map (date stamped as received by COE 02/22/19)
(2) Preliminary Jurisdictional Determination Form
(3) Appeals Form
(4) Supplemental Preapplication Form

Cc: (1) Stantec

Received by VMRC February 4, 2021 /blh



LEGEND:

- FORESTED WETLAND (PFO) LIMITS
- EMERGENT WETLAND (PEM) LIMITS
- PERENNIAL STREAM CHANNEL (R3) LIMITS
- INTERMITTENT STREAM CHANNEL (R4) LIMITS
- 5 — DATA POINT LOCATION
- A-8 — FLAG NUMBER

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)

STREAM CHANNELS

PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

N

0 100 200

APPROXIMATE SCALE (FEET)

Stantec
150 Riverside Parkway, Suite 301
Fredericksburg, VA 22406
PHONE:(540) 785-5544 FAX:(540) 785-1742

FOR:		DELINEATION MAP		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA				6
JOB NUMBER: 203401129	DRAWN BY: JM	CHECKED BY: RH	APPROVED BY: LC	DATE: 2/19/2019

FILEPATH:U:\203401129\03_data\gis_cad\cad\01129n_delin_20190219.dwg[jmann]Feb 22, 2019 at 9:33[Layout: D SIZE LANDSCAPE

Appendix 2 - PRELIMINARY JURISDICTIONAL DETERMINATION (PJD) FORM

BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR PJD: 04/08/19

B. NAME AND ADDRESS OF PERSON REQUESTING PJD:
NOVEC c/o Mr. George Coutts, 5399 Wellington Branch Drive, Gainesville, Virginia 20155

C. DISTRICT OFFICE, FILE NAME, AND NUMBER:
NAO, Wildwood Substation, NAO-2019-00325

D. PROJECT LOCATION(S) AND BACKGROUND INFORMATION:
(USE THE TABLE BELOW TO DOCUMENT MULTIPLE AQUATIC RESOURCES AND/OR AQUATIC RESOURCES AT DIFFERENT SITES)

State: Virginia County/parish/borough: Loudoun City:

Center coordinates of site (lat/long in degree decimal format): 39.046837, -77.540974

Lat.: xx.xxx° Long.: yy.yyy°

Universal Transverse Mercator:

Name of nearest waterbody: Goose Creek

E. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☐ Office (Desk) Determination. Date:

☑ Field Determination. Date(s): 04/03/19

TABLE OF AQUATIC RESOURCES IN REVIEW AREA WHICH "MAY BE" SUBJECT TO REGULATORY JURISDICTION.

Site number	Latitude (decimal degrees)	Longitude (decimal degrees)	Estimated amount of aquatic resource in review area (acreage and linear feet, if applicable)	Type of aquatic resource (i.e., wetland vs. non-wetland waters)	Geographic authority to which the aquatic resource "may be" subject (i.e., Section 404 or Section 10/404)
PEM	39.046837	-77.540974	1.75 acres	Wetland	Section 404
PFO	39.046837	-77.540974	3.12 acres	Wetland	Section 404
R3	39.046837	-77.540974	1,105 linear feet	Non-wetland waters	Section 404
R4	39.046837	-77.540974	2,311 linear feet	Non-wetland waters	Section 404

1) The Corps of Engineers believes that there may be jurisdictional aquatic resources in the review area, and the requestor of this PJD is hereby advised of his or her option to request and obtain an approved JD (AJD) for that review area based on an informed decision after having discussed the various types of JDs and their characteristics and circumstances when they may be appropriate.
2) In any circumstance where a permit applicant obtains an individual permit, or a Nationwide General Permit (NWP) or other general permit verification requiring "pre-construction notification" (PCN), or requests verification for a non-reporting NWP or other general permit, and the permit applicant has not requested an AJD for the activity, the permit applicant is hereby made aware that: (1) the permit applicant has elected to seek a permit authorization based on a PJD, which does not make an official determination of jurisdictional aquatic resources; (2) the applicant has the option to request an AJD before accepting the terms and conditions of the permit authorization, and that basing a permit authorization on an AJD could possibly result in less compensatory mitigation being required or different special conditions; (3) the applicant has the right to request an individual permit rather than accepting the terms and conditions of the NWP or other general permit authorization; (4) the applicant can accept a permit authorization and thereby agree to comply with all the terms and conditions of that permit, including whatever mitigation requirements the Corps has determined to be necessary; (5) undertaking any activity in reliance upon the subject permit authorization without requesting an AJD constitutes the applicant's acceptance of the use of the PJD; (6) accepting a permit authorization (e.g., signing a proffered individual permit) or undertaking any activity in reliance on any form of Corps permit authorization based on a PJD constitutes agreement that all aquatic resources in the review area affected in any way by that activity will be treated as jurisdictional, and waives any challenge to such jurisdiction in any administrative or judicial compliance or enforcement action, or in any administrative appeal or in any Federal court; and (7) whether the applicant elects to use either an AJD or a PJD, the JD will be processed as soon as practicable. Further, an AJD, a proffered individual permit (and all terms and conditions contained therein), or individual permit denial can be administratively appealed pursuant to 33 C.F.R. Part 331. If, during an administrative appeal, it becomes appropriate to make an official determination whether geographic jurisdiction exists over aquatic resources in the review area, or to provide an official delineation of jurisdictional aquatic resources in the review area, the Corps will provide an AJD to accomplish that result, as soon as is practicable. This PJD finds that there *"may be"* waters of the U.S. and/or that there *"may be"* navigable waters of the U.S. on the subject review area, and identifies all aquatic features in the review area that could be affected by the proposed activity, based on the following information:

SUPPORTING DATA. Data reviewed for PJD (check all that apply)

Checked items should be included in subject file. Appropriately reference sources below where indicated for all checked items:

- [x] Maps, plans, plots or plat submitted by or on behalf of the PJD requestor:
  Map: "NOVEC Wildwood Substation" Delineation Map (date stamped as received by COE 02/22/19
- [x] Data sheets prepared/submitted by or on behalf of the PJD requestor.
  - [x] Office concurs with data sheets/delineation report.
  - [ ] Office does not concur with data sheets/delineation report. Rationale: _____.
- [ ] Data sheets prepared by the Corps: _____.
- [ ] Corps navigable waters' study: _____.
- [ ] U.S. Geological Survey Hydrologic Atlas: _____.
  - [ ] USGS NHD data.
  - [ ] USGS 8 and 12 digit HUC maps.
- [x] U.S. Geological Survey map(s). Cite scale & quad name: 1:24,000 & Leesburg
- [x] Natural Resources Conservation Service Soil Survey. Citation: USDA-NCSS Digital SSURGO and STATSGO data
- [x] National wetlands inventory map(s). Cite name: USFWS Digital Wetlands and Riparian data
- [ ] State/local wetland inventory map(s): _____.
- [ ] FEMA/FIRM maps: _____.
- [ ] 100-year Floodplain Elevation is: ____. (National Geodetic Vertical Datum of 1929)
- [x] Photographs: [x] Aerial (Name & Date): Google Earth Pro (Date range: 1989-2016).
  or [ ] Other (Name & Date): _____.
- [ ] Previous determination(s). File no. and date of response letter: _____.
- [ ] Other information (please specify): _____.

IMPORTANT NOTE: The information recorded on this form has not necessarily been verified by the Corps and should not be relied upon for later jurisdictional determinations.

DUNN.BRITTANY.N.1513285520 Digitally signed by DUNN.BRITTANY.N.1513285520 DN: c=US, o=U.S. Government, ou=DoD, ou=PKI, ou=USA, cn=DUNN.BRITTANY.N.1513285520 Date: 2019.04.07 16:10:28 -04'00'

Signature and date of Regulatory staff member completing PJD

George E. Lattig 4/29/2019

Signature and date of person requesting PJD (REQUIRED, unless obtaining the signature is impracticable)[1]

[1] Districts may establish timeframes for requestor to return signed PJD forms. If the requestor does not respond within the established time frame, the district may presume concurrence and no additional follow up is necessary prior to finalizing an action.

NOTIFICATION OF ADMINISTRATIVE APPEAL OPTIONS AND PROCESS AND REQUEST FOR APPEAL

Applicant: Northern Virginia Electric Cooperative (NOVEC) c/o Mr. George Coutts	File Number: NAO-2019-00325	Date: 04/08/19

Attached is:		See Section below
	INITIAL PROFFERED PERMIT (Standard Permit or Letter of permission)	A
	PROFFERED PERMIT (Standard Permit or Letter of permission)	B
	PERMIT DENIAL	C
	APPROVED JURISDICTIONAL DETERMINATION	D
X	PRELIMINARY JURISDICTIONAL DETERMINATION	E

SECTION I - The following identifies your rights and options regarding an administrative appeal of the above decision. Additional information may be found at http://www.usace.army.mil/Missions/CivilWorks/RegulatoryProgramandPermits/appeals.aspx or Corps regulations at 33 CFR Part 331.

A: INITIAL PROFFERED PERMIT: You may accept or object to the permit.

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- OBJECT: If you object to the permit (Standard or LOP) because of certain terms and conditions therein, you may request that the permit be modified accordingly. You must complete Section II of this form and return the form to the district engineer. Your objections must be received by the district engineer within 60 days of the date of this notice, or you will forfeit your right to appeal the permit in the future. Upon receipt of your letter, the district engineer will evaluate your objections and may: (a) modify the permit to address all of your concerns, (b) modify the permit to address some of your objections, or (c) not modify the permit having determined that the permit should be issued as previously written. After evaluating your objections, the district engineer will send you a proffered permit for your reconsideration, as indicated in Section B below.

B: PROFFERED PERMIT: You may accept or appeal the permit

- ACCEPT: If you received a Standard Permit, you may sign the permit document and return it to the district engineer for final authorization. If you received a Letter of Permission (LOP), you may accept the LOP and your work is authorized. Your signature on the Standard Permit or acceptance of the LOP means that you accept the permit in its entirety, and waive all rights to appeal the permit, including its terms and conditions, and approved jurisdictional determinations associated with the permit.
- APPEAL: If you choose to decline the proffered permit (Standard or LOP) because of certain terms and conditions therein, you may appeal the declined permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

C: PERMIT DENIAL: You may appeal the denial of a permit under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

D: APPROVED JURISDICTIONAL DETERMINATION: You may accept or appeal the approved JD or provide new information.

- ACCEPT: You do not need to notify the Corps to accept an approved JD. Failure to notify the Corps within 60 days of the date of this notice, means that you accept the approved JD in its entirety, and waive all rights to appeal the approved JD.
- APPEAL: If you disagree with the approved JD, you may appeal the approved JD under the Corps of Engineers Administrative Appeal Process by completing Section II of this form and sending the form to the division engineer. This form must be received by the division engineer within 60 days of the date of this notice.

E: PRELIMINARY JURISDICTIONAL DETERMINATION: You do not need to respond to the Corps regarding the preliminary JD. The Preliminary JD is not appealable. If you wish, you may request an approved JD (which may be appealed), by contacting the Corps district for further instruction. Also you may provide new information for further consideration by the Corps to reevaluate the JD.

SECTION II - REQUEST FOR APPEAL or OBJECTIONS TO AN INITIAL PROFFERED PERMIT

REASONS FOR APPEAL OR OBJECTIONS: (Describe your reasons for appealing the decision or your objections to an initial proffered permit in clear concise statements. You may attach additional information to this form to clarify where your reasons or objections are addressed in the administrative record.)

ADDITIONAL INFORMATION: The appeal is limited to a review of the administrative record, the Corps memorandum for the record of the appeal conference or meeting, and any supplemental information that the review officer has determined is needed to clarify the administrative record. Neither the appellant nor the Corps may add new information or analyses to the record. However, you may provide additional information to clarify the location of information that is already in the administrative record.

POINT OF CONTACT FOR QUESTIONS OR INFORMATION:

If you have questions regarding this decision and/or the appeal process you may contact: Ms. Brittany N. Dunn U.S. Army Corps of Engineers 1329 Alum Spring Road, Suite 102 Fredericksburg, VA 22401 Telephone number: 757-201-7029	If you only have questions regarding the appeal process you may also contact: Mr. James W. Haggerty Regulatory Program Manager (CENAD-PD-OR) U.S. Army Corps of Engineers Fort Hamilton Military Community 301 General Lee Avenue Brooklyn, New York 11252-6700 Telephone number: 347-370-4650

RIGHT OF ENTRY: Your signature below grants the right of entry to Corps of Engineers personnel, and any government consultants, to conduct investigations of the project site during the course of the appeal process. You will be provided a 15 day notice of any site investigation, and will have the opportunity to participate in all site investigations.

_____ Signature of appellant or agent.	Date:	Telephone number:

Received by VMRC February 4, 2021 /blh

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

April 8, 2019

Supplemental Preapplication Information

Project Number: NAO-2019-00325
Applicant: Northern Virginia Electric Cooperative (NOVEC) c/o Mr. George Coutts
Project Location: approximately 27.60-acre site situated northeast of Sycolin Road (Route 643), south of the Dulles Greenway (Route 267), and west of Belmont Ridge Road (Route 659) in Loudoun County, Virginia (39.046837, -77.540974)

1. A search of the Virginia Department of Historic Resources data conducted via VCRIS and/or CorpsMap revealed the following:

   ☐ No known historic properties are located on the subject property.

   ☐ The following known architectural resources are located on the subject property:

   ☒ The following known archaeological resources are located on the subject property:
   DHR ID 44LD0468

   ☒ The following known architectural and archaeological resources are located in the vicinity of the subject property:
   DHR ID 44LD1329, DHR ID 44LD0467, 44LD0469, DHR ID 44LD1632, DHR ID 053-6396, & DHR ID 053-6361

   ☐ American Battlefield Protection Program (ABPP) consultation may be required.

   ☒ Tribal consultation may be required.

NOTE:
1) The information above is for planning purposes only. In most cases, the property has not been surveyed for historic resources. Undiscovered historic resources may be located on the subject property or adjacent properties and this supplemental information is not intended to satisfy the Corps' requirements under Section 106 of the National Historic Preservation Act (NHPA).
2) Prospective permittees should be aware that Section 110k of the NHPA (16 U.S.C. 470h-2(k)) prevents the Corps from granting a permit or other assistance to an applicant who, with intent to avoid the requirements of Section 106 of the NHPA, has intentionally significantly adversely affected a historic property to which the permit would relate, or having legal power to prevent it, allowed such significant adverse effect to occur, unless the Corps, after consultation with the Advisory Council on Historic Preservation (ACHP), determines that circumstances justify granting such assistance despite the adverse effect created or permitted by the applicant.

2. A search of U.S. Fish and Wildlife Service's IPaC system revealed the following:

   ☐ No known populations of federally listed species are located on the subject property.

   ☒ The following federally listed species may be present on the subject property: Northern **Long-eared Bat *Myotis septentrionalis***

Please note this information is being provided to you based on the preliminary data you submitted to the Corps relative to project boundaries and project plans. Consequently, these findings and recommendations are subject to change if the project scope changes or new information becomes available and the accuracy of the data.

Received by VMRC February 4, 2021 /blh

Stantec Consulting Services Inc.
150 Riverside Parkway, Suite 301
Fredericksburg, Virginia 22406

February 22, 2019
File: 203401129

Attention: Mr. Ron Stouffer
U.S. Army Corps of Engineers
Northern Virginia Field Office
18139 Triangle Plaza, Suite 213
Dumfries, Virginia 22026
Via Email: ron.h.stouffer@usace.army.mil

Reference: Request for Preliminary Jurisdictional Determination
NOVEC Wildwood Substation, Loudoun County, Virginia
Latitude: 39.046780˚ Longitude: -77.540235˚

Applicant: Mr. George Coutts
Northern Virginia Electric Cooperative (NOVEC)
5399 Wellington Branch Drive
Gainesville, Virginia 20155

Dear Mr. Stouffer:

Stantec Consulting Services, Inc. (Stantec) has been retained by Northern Virginia Electric Cooperative (NOVEC) to conduct a detailed investigation of waters of the U.S., including wetlands, on the above-referenced project. The approximate 27.60-acre site is located within the Goose Creek drainage basin in Loudoun County, Virginia. The site is situated northeast of Sycolin Road (Route 643), south of the Dulles Greenway (Route 267), west of Belmont Ridge Road (Route 659), and can be accessed via Sycolin Road (Figures 1 & 2). A copy of the Pre-Application and/or Jurisdictional Waters Determination Request Form is provided in Appendix A.

Off-site Evaluation

Prior to conducting fieldwork, Stantec consulted the U.S. Geological Survey (USGS) 7.5-minute Topographical Quadrangle Map for Leesburg, Virginia (1981 revision), the National Wetlands Inventory Interactive Mapper (NWI), administered by the U.S. Fish and Wildlife Service (USFWS), and the Web Soil Survey, administered by the Natural Resources Conservation Service (NRCS). The USGS quad map depicts a gently to moderately sloping site comprised of cleared and forested land, with a transmission line right-of-way (ROW) at the western end of the site and an unnamed intermittent stream in the eastern portion of the site. The NWI map (Figure 3) depicts an intermittent stream system but no wetland features within the project boundaries. Additionally, the soil survey (Figure 4) indicates that the site is underlain primarily by Legore loam, Elbert silty clay loam, Montalto silty clay loam, and Waxpool silt loam. Elbert silty clay loam and Waxpool silt loam are classified as hydric by the NRCS in Loudoun County, Virginia. Legore silt loam and Montalto silty clay loam are classified as non-hydric but may contain minor hydric inclusions. Additionally, the flood plain map (Figure 5) shows the subject property lies outside of the 100-year floodplain (Zone X – minimal flood hazard).

On-site Evaluation

Fieldwork was conducted during August 2018 using the Routine Determination Method as outlined in the 1987 *Corps of Engineers Wetland Delineation Manual* and methods described in the 2012 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont*

Reference: Wildwood Substation, Loudoun County, Virginia

Region (Version 2.0). Wetland flags were placed in the field by Stantec and sequentially numbered to provide an on-site record of the delineation. The data sheets (Appendix B) used in this investigation are attached along with the Delineation Map (Figure 6) showing the survey located limits of wetlands and other water features, as well as data point locations.

Site Description

Jurisdictional features identified by Stantec within the project limits may be classified as palustrine forested and emergent wetlands along with associated non-vegetated stream channels. Wetland vegetation is typified by green ash (*Fraxinuns pennsylvanica*), red maple (*Acer rubrum*), American sweetgum (*Liquidambar styraciflua*), northern spicebush (*Lindera benzoin*), Japanese stiltgrass (*Microstegium vimineum*), common rush (*Juncus effusus*), shallow sedge (*Carex lurida*), seedbox (*Ludwigia alternifolia*), and roundleaf greenbriar (*Smilax rotundifolia*). The transition from wetland to upland is generally identified by a shift in the vegetative community and a shift from hydric to non-hydric soils. Table 1 shows the dimensions of the identified jurisdictional resources within the project area.

Table 1. Wetlands and WOUS Calculations

PEM (Acres)	**PFO** (Acres)	**Stream Channels (R3)** Acres (LF)	**Stream Channels (R4)** Acres (LF)
1.75	3.12	0.20 (1,105)	0.22 (2,311)

On behalf of our client, Stantec respectfully requests that the Corps confirm our delineation. We would appreciate the opportunity to meet with you on-site to present our fieldwork. Please call to set up a meeting date or to discuss any questions regarding our investigation.

Thank you for your cooperation in this matter.

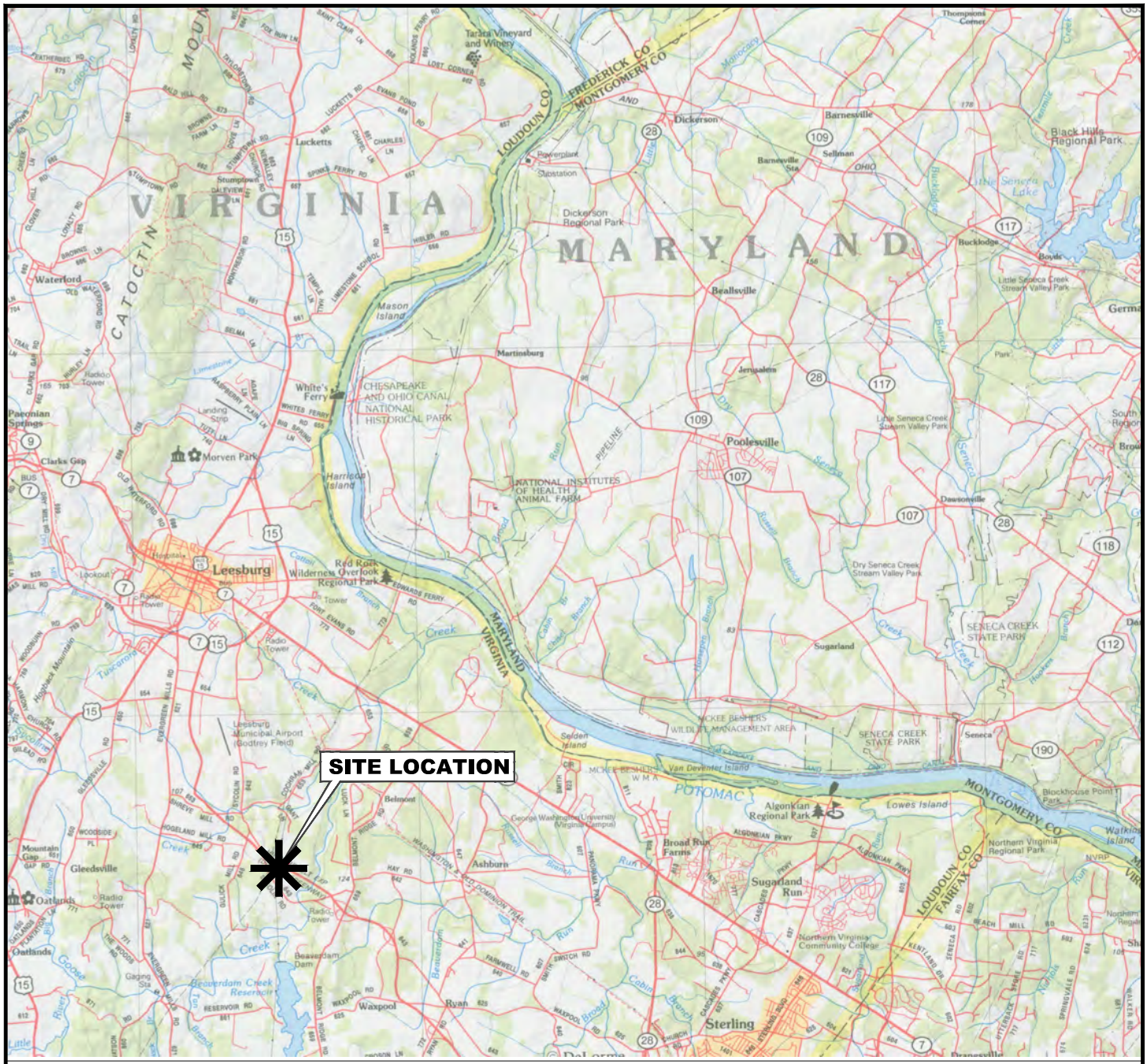
Regards,

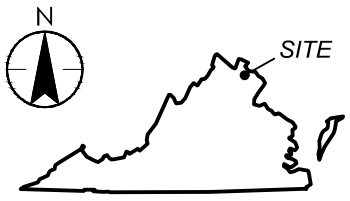
Stantec Consulting Services

Jason Mann
Senior Ecologist
Phone: (540) 785-5544
Fax: (540) 785-1742
jason.mann@stantec.com

Attachment: Figures 1-6 & Appendices A-B

c. Curt Crouch, PE – Dewberry
Loretta Cummings, Ph.D. – Stantec





1.2 0 1.2 2.4 3.6 4.8 6 7.2 8.4

SCALE IN MILE

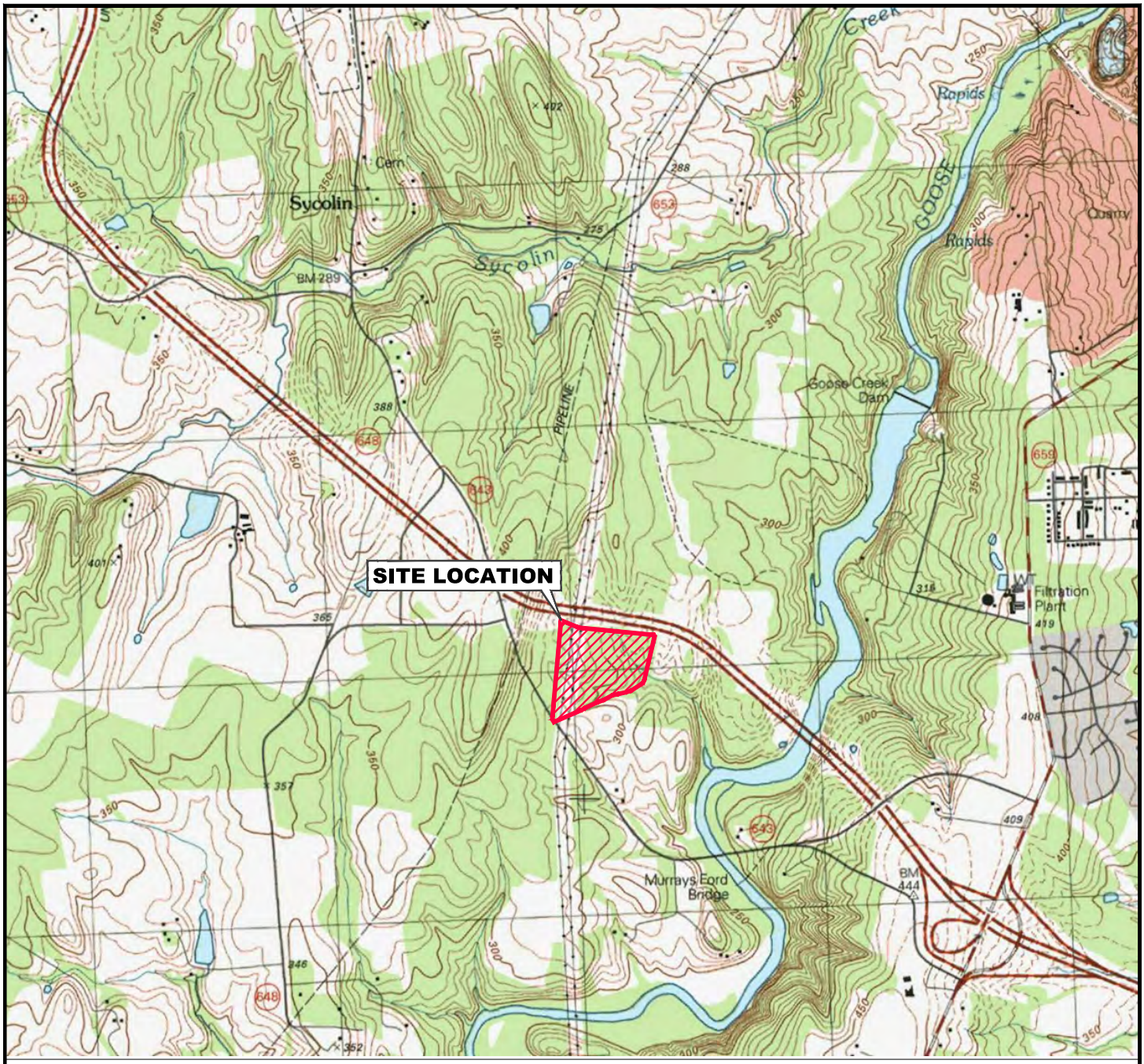
SOURCE: VA. ATLAS & GAZETEER & DELORME MAPPING CO., 1995.

Stantec

150 Riverside Parkway, Suite 301
Fredericksburg, VA 22406
PHONE: (540) 785-5544 FAX: (540) 785-1742

FOR:		SITE VICINITY MAP	FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA			1
JOB NUMBER: 203401129	DRAWN BY: RH	CHECKED BY: AF	APPROVED BY: LC	DATE: MAY 2018

FILEPATH:U:\203401129\03_data\gis_cad\cad\01129n_loc_vic.dwg|jmann|Feb 19, 2019 at 14:00|Layout: SITE VICINITY MAP



LATITUDE: 39.046780°
LONGITUDE: 77.540235°
SOURCE: USGS 7.5 MINUTE SERIES TOPOGRAPHIC MAP, LEESBURG, VA QUADRANGLE, 1994 .

Stantec

150 Riverside Parkway, Suite 301
Fredericksburg, VA 22406
PHONE: (540) 785-5544 FAX: (540) 785-1742

FOR:		SITE LOCATION MAP		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA				2
JOB NUMBER: 203401129	DRAWN BY: RH	CHECKED BY: AF	APPROVED BY: LC	DATE: MAY 2018

FILEPATH:U:\203401129\03_data\gis_cad\cad\01129n_loc_vic.dwg|jmann|Feb 19, 2019 at 14:01|Layout: SITE LOCATION MAP

U.S. Fish and Wildlife Service
National Wetlands Inventory

Figure 3 - Wildwood Substation

February 19, 2019

Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

This map is for general reference only. The US Fish and Wildlife Service is not responsible for the accuracy or currentness of the base data shown on this map. All wetlands related data should be used in accordance with the layer metadata found on the Wetlands Mapper web site.

National Wetlands Inventory (NWI)
This page was produced by the NWI mapper

Received by VMRC February 4, 2021 /blh

Soil Map—Loudoun County, Virginia
(Figure 4 - Wildwood Substation)

Map Scale: 1:3,570 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Loudoun County, Virginia
Survey Area Data: Version 15, Aug 28, 2018

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

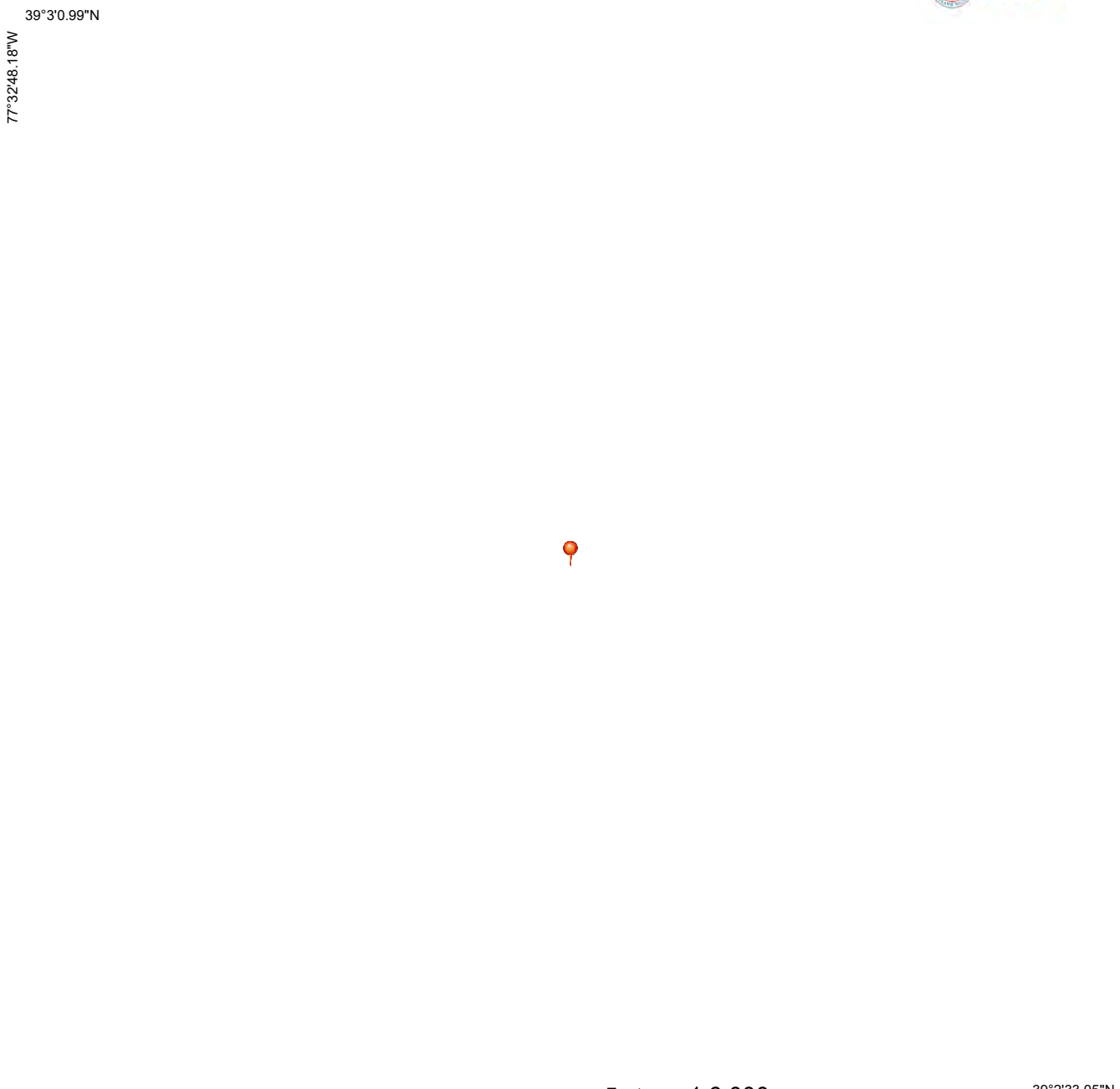
Date(s) aerial images were photographed: Sep 25, 2014—Mar 10, 2017

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
14B	Manassas silt loam, 2 to 7 percent slopes	0.2	0.7%
64B	Legore loam, 2 to 7 percent slopes, very stony	12.6	40.4%
64C	Legore loam, 7 to 15 percent slopes, very stony	1.1	3.6%
65B	Montalto silty clay loam, 2 to 7 percent slopes	3.6	11.5%
66A	Waxpool silt loam, occasionally ponded, 0 to 2 percent slopes	3.0	9.6%
67B	Jackland and Haymarket soils, 2 to 7 percent slopes	0.0	0.1%
69A	Elbert silty clay loam, 0 to 2 percent slopes, frequently flooded	10.6	34.1%
Totals for Area of Interest		**31.1**	**100.0%**

Figure 5 - National Flood Hazard Layer FIRMette



0 250 500 1,000 1,500 2,000 Feet

1:6,000

Received by VMRC February 4, 2021 /blh

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 Cross Sections with 1% Annual Chance
- 17.5 Water Surface Elevation
- Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 1/4/2019 at 9:10:20 AM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

DULLES GREENWAY

PROJECT LIMITS

PROJECT LIMITS

SYCOLIN ROAD

BYE-4
BYD-16
BYD-5
BYC-89
BYE-11
BYF-1
BYF-10
BYG-1
BYG-27
BYB-191
BYB-53
BYB-117
BYG-129
BYB-7
BYG-168
BYK-61
BYL-1
BYK-1
BYL-121
BYM-2
BYL-92
BYL-104
BYM-26

1 2 3 4 5 6 7 8 9

LEGEND:

- FORESTED WETLAND (PFO) LIMITS
- EMERGENT WETLAND (PEM) LIMITS
- PERENNIAL STREAM CHANNEL (R3) LIMITS
- INTERMITTENT STREAM CHANNEL (R4) LIMITS
- 5 DATA POINT LOCATION
- A-8 FLAG NUMBER

SITE DATA:

PROJECT AREA	27.60 ACRES ±.
PFO WETLANDS	3.12 ACRES ±
PEM WETLANDS	1.75 ACRES ±
STREAM CHANNELS	0.42 ACRES ±
(EXCLUDING WETLANDS)	(3,416 L.F. ±)

STREAM CHANNELS

PERENNIAL STREAM CHANNELS (R3)	0.20 ACRES ±
(EXCLUDING WETLANDS)	(1,105 L.F. ±)
INTERMITTENT STREAM CHANNELS (R4)	0.22 ACRES ±
(EXCLUDING WETLANDS)	(2,311 L.F. ±)

NOTES:

1. COORDINATE SYSTEM NAD 1983 STATE PLANE VIRGINIA NORTH.
2. TOPOGRAPHY PROVIDED BY DEWBERRY.
3. THE LIMITS OF WETLANDS AND OTHER WATERS OF THE U.S. SHOWN ON THIS MAP HAVE BEEN FIELD SURVEYED AND ARE FOR PLANNING PURPOSES ONLY.

N

0 100 200

APPROXIMATE SCALE (FEET)

Stantec
150 Riverside Parkway, Suite 301
Fredericksburg, VA 22406
PHONE: (540) 785-5544 FAX:(540) 785-1742

FOR:		DELINEATION MAP		FIGURE:
NOVEC WILDWOOD SUBSTATION LOUDOUN COUNTY, VIRGINIA				6
JOB NUMBER: 203401129	DRAWN BY: JM	CHECKED BY: RH	APPROVED BY: LC	DATE: 2/19/2019

FILEPATH:U:\203401129\03_data\gis_cad\cad\01129n_delin_20190219.dwg[jmarvil]Feb 22, 2019 at 9:33[Layout: D SIZE LANDSCAPE

APPENDIX A
PRE-APPLICATION AND JURISDICTIONAL DETERMINATION REQUEST FORM

Received by VMRC February 4, 2021 /blh

NORFOLK DISTRICT REGULATORY OFFICE
PRE-APPLICATION AND/OR JURISDICTIONAL WATERS DETERMINATION REQUEST FORM

This form is used when you want to determine if areas on your property fall under regulatory requirements of the U.S. Army Corps of Engineers (USACE). Please supply the following information and supporting documents described below. This form can be filled out online and/or printed and then mailed, faxed, or e-mailed to the Norfolk District. Submitting this request authorizes the US Army Corps of Engineers to field inspect the property site, if necessary, to help in the determination process. **THIS FORM MUST BE SIGNED BY THE PROPERTY OWNER TO BE CONSIDERED A FORMAL REQUEST.**

The printed form and supporting documents should be mailed to:

U.S. Army Corps of Engineers, Norfolk District
Regulatory Office
803 Front Street
Norfolk, Virginia 23510-1096

Or faxed to (757) 201-7678

Or sent via e-mail to: CENAO.REG_ROD@usace.army.mil

Additional information on the Regulatory Program is available on our website at:
http://www.nao.usace.army.mil/
Please contact us at 757-201-7652 if you need any assistance with filling out this form.

Location and Information about Property to be subject to a Jurisdictional Determination:

1. Date of Request: **February 22, 2019**

2. Project Name: **NOVEC Wildwood Substation**

3. City or County where property located: **Loudoun County, Virginia**

4. Address of property and directions (attach a map of the property location and a copy of the property plat): **The approximate 27.60-acre site is located within the Goose Creek drainage basin in Loudoun County, Virginia. The site is situated northeast of Sycolin Road (Route 643), south of the Dulles Greenway (Route 267), west of Belmont Ridge Road (Route 659), and can be accessed via Sycolin Road.**

5. Coordinates of property (if known): **Latitude: 39.046780° Longitude: -77.540235°**

6. Size of property in acres: **27.60**

7. Tax Parcel Number / GPIN (if available):

8. Name of Nearest Waterway: **Goose Creek**

9. Brief Description of Proposed Activity, Reason for Preapplication Request, and/or Reason for Jurisdictional Waters Determination Request: **Environmental constraints analysis.**

10. Has a wetland delineation/determination been completed by a consultant or the Corps on the property previously? ☐ YES ☐ NO ☒ UNKNOWN,

If yes, please provide the name of the consultant and/or Corps staff and Corps permit number, if available:

Property Owner Contact Information:

Property Owner Name: **NOVEC** **Attn: Mr. George Coutts**
Mailing Address: **5399 Wellington Branch Drive**
City: State: Zip: **Gainesville, Virginia 20155**
Daytime Telephone: **(703) 468-2211**
E-mail Address:

If the person requesting the Jurisdictional Determination is **NOT** the Property Owner, please also supply the Requestor's contact information here:

Requestor Name: **Jason Mann – Stantec**
Mailing Address: **150 Riverside Parkway, Suite 301**
City: State: Zip: **Fredericksburg, Virginia 22406**
Daytime Telephone: **(540) 785-5544**
E-mail Address: **jason.mann@stantec.com**

Additionally, if you have any of the following information, please include it with your request: wetland delineation map, other relevant maps, drain tile survey, topographic survey, and/or site photographs.

CERTIFICATION: I am hereby requesting a preapplication consultation or jurisdictional waters and/or wetlands determination from the U.S. Army Corps of Engineers, for the property(ies) I have described herein. I agree to allow the duly authorized representatives of the Norfolk District Corps of Engineers and other regulatory or advisory agencies to enter upon the premises of the project site at reasonable times to evaluate inspect and photograph site conditions. This consent to enter the property is superior to, takes precedence over, and waives any communication to the contrary. For example, if the property is posted as "no trespassing" this consent specifically supercedes and waives that prohibition and grants permission to enter the property despite such posting. I hereby certify that the information contained in the Request for a Jurisdictional Determination is accurate and complete:

George E. Coutts — Requestor's Signature

Feb. 21, 2019 — Date

Revised March 2013

APPENDIX B
WETLAND DETERMINATION DATA FORMS

Received by VMRC February 4, 2021 /blh

Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 1

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR P
State:	VIRGINIA	Site Latitude:	39.046713°
Investigator(s):	B. YOUNG	Site Longitude:	-77.541254°
Date:	8/17/2018	Soil Map Unit Name:	ELBERT SILTY CLAY LOAM

Summary of Findings: **WETLAND BELOW FLAG BYG-7.**

Hydrophytic Vegetation is Present:	X	Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:	X	Disturbed Parameters (see Remarks):		Local Relief:	CONCAVE
Wetland Hydrology is Present:	X	Problematic Parameters (see Remarks):		Landform:	DRAINAGEWAY
Sampled Area is within a Wetland:	X	Atypical Climate/Hydrology (see Remarks):		Slope %:	0-3

Hydrology Parameter:

Primary Indicators:		*Secondary Indicators:*
___ Surface Water (A1)	**X** Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
X Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water: ___
Water Table: ___
Saturated soil: O

Remarks: **HYDROLOGY PARAMETER MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Juncus effusus	Herbaceous	FACW	25
Carex lurida	Herbaceous	OBL	15

Non-Dominant Species	Stratum	IND	%
Scirpus cyperinus	Herbaceous	FACW	10
Cyperus strigosus	Herbaceous	FACW	10
Rubus argutus	Herbaceous	FACU	3
Ludwigia alternifolia	Herbaceous	FACW	3

% Dominant species FAC or wetter: 100%

Prevalence Index: 1.9

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation: **X**
Dominance Test >50%: **X**
Prevalence Index is ≤ 3.0: **X**
Morphological Adaptations: ___
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-1	7.5YR 4/6	100					CLAY LOAM
1-10	10YR 6/2	90	7.5YR 4/4	10	C	M	CLAY LOAM
10-20	7.5YR 4/1	80	7.5YR 4/4	15	C	M	CLAY LOAM
			10YR 5/3	5	C	M	

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	**X** Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type: ___
Depth (inches): ___

Remarks: **SOIL PARAMETER MET.**

Received by VMRC February 4, 2021 /blh

Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 2

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	ELBERT SILTY CLAY LOAM

Summary of Findings: **UPLAND NEAR FLAG BYG-8;**

Hydrophytic Vegetation is Present:		Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:		Disturbed Parameters (see Remarks):		Local Relief:	CONVEX
Wetland Hydrology is Present:		Problematic Parameters (see Remarks):		Landform:	SLOPE
Sampled Area is within a Wetland:		Atypical Climate/Hydrology (see Remarks):		Slope %:	2-3

Hydrology Parameter:

Primary Indicators:		***Secondary Indicators:***
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
___ Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water:
Water Table:
Saturated soil:

Remarks: **HYDROLOGY PARAMETER NOT MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Rubus argutus	Herbaceous	FACU	30
Solanum carolinense	Herbaceous	FACU	10
Lonicera japonica	Vine	FACU	5

Non-Dominant Species	Stratum	IND	%
Juncus effusus	Herbaceous	FACW	5
Andropogon virginicus	Herbaceous	FACU	3

% Dominant species FAC or wetter: O

Prevalence Index: 3.8

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation:
Dominance Test >50%:
Prevalence Index is ≤ 3.0:
Morphological Adaptations:
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER NOT MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-5	7.5YR 4/6	100					CLAY LOAM
5-20	7.5YR 5/6	100					CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	___ Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type:
Depth (inches):

Remarks: **SOIL PARAMETER NOT MET.**

Received by VMRC February 4, 2021 /blh

Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 3

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	LEGORE LOAM

Summary of Findings: **WETLAND NEAR FLAG BYB-167;**

Hydrophytic Vegetation is Present:	X	Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:	X	Disturbed Parameters (see Remarks):		Local Relief:	NONE
Wetland Hydrology is Present:	X	Problematic Parameters (see Remarks):		Landform:	SLOPE
Sampled Area is within a Wetland:	X	Atypical Climate/Hydrology (see Remarks):		Slope %:	2-3

Hydrology Parameter:

Primary Indicators:		***Secondary Indicators:***
		___ Surface Soil Cracks (B6)
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Sparsely Vegetated Concave Surface (B8)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	X Drainage Patterns (B10)
X Saturation (A3)	___ True Aquatic Plants (B14)	___ Moss Trim Lines (B16)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Dry-Season Water Table (C2)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Crayfish Burrows (C8)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Saturation Visible on Aerial Imagery (C9)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Stunted or Stressed Plants (D1)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Geomorphic Position (D2)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water: ___
Water Table: ___
Saturated soil: 4

Remarks: **HYDROLOGY PARAMETER MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Fraxinus pennsylvanica	Tree	FACW	20
Acer rubrum	Tree	FAC	15
Fraxinus pennsylvanica	Sapling	FACW	10
Acer rubrum	Sapling	FAC	10
Liquidambar styraciflua	Sapling	FAC	10
Fraxinus pennsylvanica	Shrub	FACW	5
Lindera benzoin	Shrub	FAC	5
Microstegium vimineum	Herbaceous	FAC	15

Non-Dominant Species	Stratum	IND	%
Juniperus virginiana	Tree	FACU	3

% Dominant species FAC or wetter: 100%

Prevalence Index: 2.7

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation: ___
Dominance Test >50%: X
Prevalence Index is ≤ 3.0: X
Morphological Adaptations: ___
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-4	2.5Y 3/3	100					LOAM
4-20	2.5Y 6/2	95	10YR 4/6	5	C	M	CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	X Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type: ___
Depth (inches): ___

Remarks: **SOIL PARAMETER MET.**

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Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 4

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	LEGORE LOAM

Summary of Findings: **UPLAND NEAR FLAG BYB-167;**

Hydrophytic Vegetation is Present:		Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:		Disturbed Parameters (see Remarks):		Local Relief:	NONE
Wetland Hydrology is Present:		Problematic Parameters (see Remarks):		Landform:	SLOPE
Sampled Area is within a Wetland:		Atypical Climate/Hydrology (see Remarks):		Slope %:	2-3

Hydrology Parameter:

Primary Indicators:		***Secondary Indicators:***
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
___ Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water:
Water Table:
Saturated soil:

Remarks: **HYDROLOGY PARAMETER NOT MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Quercus alba	Tree	FACU	15
Juniperus virginiana	Tree	FACU	10
Fraxinus pennsylvanica	Sapling	FACW	15
Acer rubrum	Sapling	FAC	5
Quercus rubra	Shrub	FACU	10
Quercus falcata	Shrub	FACU	10
Microstegium vimineum	Herbaceous	FAC	15
Lonicera japonica	Vine	FACU	5

Non-Dominant Species	Stratum	IND	%
Polystichum acrostichoides	Herbaceous	FACU	3

% Dominant species FAC or wetter: 38%

Prevalence Index: 3.4

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation:
Dominance Test >50%:
Prevalence Index is ≤ 3.0:
Morphological Adaptations:
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER NOT MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-6	2.5Y 3/4	100					CLAY LOAM
6-20	2.5Y 5/4	100					CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	___ Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type:
Depth (inches):

Remarks: **SOIL PARAMETER NOT MET.**

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Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 5

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	LEGORE LOAM

Summary of Findings: **UPLAND NEAR FLAG BYG-130;**

Hydrophytic Vegetation is Present:		Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:		Disturbed Parameters (see Remarks):		Local Relief:	CONVEX
Wetland Hydrology is Present:		Problematic Parameters (see Remarks):		Landform:	SLOPE
Sampled Area is within a Wetland:		Atypical Climate/Hydrology (see Remarks):		Slope %:	3-5

Hydrology Parameter:

Primary Indicators:		***Secondary Indicators:***
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
___ Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water:
Water Table:
Saturated soil:

Remarks: **HYDROLOGY PARAMETER NOT MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Juniperus virginiana	Tree	FACU	55
Juniperus virginiana	Sapling	FACU	20
Fraxinus pennsylvanica	Shrub	FACW	5
Viburnum prunifolium	Shrub	FACU	5
Microstegium vimineum	Herbaceous	FAC	60
Lonicera japonica	Vine	FACU	5

Non-Dominant Species	Stratum	IND	%
Polystichum acrostichoides	Herbaceous	FACU	3

% Dominant species FAC or wetter: 33%

Prevalence Index: 3.5

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation:
Dominance Test >50%:
Prevalence Index is ≤ 3.0:
Morphological Adaptations:
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER NOT MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-1	10YR 3/2	100					LOAM
1-20	7.5YR 5/3	100					CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	___ Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type:
Depth (inches):

Remarks: **SOIL PARAMETER NOT MET.**

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Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 6

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	LEGORE LOAM

Summary of Findings: **UPLAND NEAR FLAG BYK-40;**

Hydrophytic Vegetation is Present:	X	Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:		Disturbed Parameters (see Remarks):		Local Relief:	NONE
Wetland Hydrology is Present:		Problematic Parameters (see Remarks):		Landform:	SLOPE
Sampled Area is within a Wetland:		Atypical Climate/Hydrology (see Remarks):		Slope %:	2-3

Hydrology Parameter:

Primary Indicators:		*Secondary Indicators:*
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
___ Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water:
Water Table:
Saturated soil:

Remarks: **HYDROLOGY PARAMETER NOT MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Juniperus virginiana	Tree	FACU	65
Juniperus virginiana	Sapling	FACU	15
Fraxinus pennsylvanica	Shrub	FACW	5
Microstegium vimineum	Herbaceous	FAC	45
Smilax rotundifolia	Vine	FAC	10

Non-Dominant Species	Stratum	IND	%

% Dominant species FAC or wetter: 60%

Prevalence Index: 3.5

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation:
Dominance Test >50%: **X**
Prevalence Index is ≤ 3.0:
Morphological Adaptations:
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-20	7.5YR 6/6	100					CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	___ Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type:
Depth (inches):

Remarks: **SOIL PARAMETER NOT MET.**

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Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 7

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	ELBERT SILTY CLAY LOAM

Summary of Findings: **WETLAND NEAR FLAG BYK-40;**

Hydrophytic Vegetation is Present:	X	Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:	X	Disturbed Parameters (see Remarks):		Local Relief:	CONCAVE
Wetland Hydrology is Present:	X	Problematic Parameters (see Remarks):		Landform:	DRAINAGEWAY
Sampled Area is within a Wetland:	X	Atypical Climate/Hydrology (see Remarks):		Slope %:	1-2

Hydrology Parameter:

Primary Indicators:		*Secondary Indicators:*
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
X Saturation (A3)	___ True Aquatic Plants (B14)	X Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
X Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water: ___
Water Table: ___
Saturated soil: 1

Remarks: **HYDROLOGY PARAMETER MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Fraxinus pennsylvanica	Tree	FACW	20
Juniperus virginiana	Tree	FACU	15
Fraxinus pennsylvanica	Shrub	FACW	10
Microstegium vimineum	Herbaceous	FAC	45
Smilax rotundifolia	Vine	FAC	5

Non-Dominant Species	Stratum	IND	%

% Dominant species FAC or wetter: 80%

Prevalence Index: 2.8

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation: ___
Dominance Test >50%: **X**
Prevalence Index is ≤ 3.0: **X**
Morphological Adaptations: ___
Problematic Hydrophytic Vegetation: ___

Remarks: **VEGETATION PARAMETER MET.**

UNIDENTIFIED NON-DOMINANT (10%) SEDGE SPECIES PRESENT.

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-1	10YR 3/2	100					LOAM
1-12	2.5Y 5/2	90	10YR 5/8	10	C	M	CLAY LOAM
12-20	10YR 5/1	85	10YR 5/6	15	C	M	CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	X Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type: ___
Depth (inches): ___

Remarks: **SOIL PARAMETER MET.**

Received by VMRC February 4, 2021 /blh

Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 8

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	LEGORE LOAM

Summary of Findings: **UPLAND NEAR FLAG BYL-115;**

Hydrophytic Vegetation is Present:		Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:		Disturbed Parameters (see Remarks):		Local Relief:	CONVEX
Wetland Hydrology is Present:		Problematic Parameters (see Remarks):		Landform:	SLOPE
Sampled Area is within a Wetland:		Atypical Climate/Hydrology (see Remarks):		Slope %:	2-3

Hydrology Parameter:

Primary Indicators:		***Secondary Indicators:***
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
___ Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		___ FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water:
Water Table:
Saturated soil:

Remarks: **HYDROLOGY PARAMETER NOT MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Juniperus virginiana	Shrub	FACU	5
Acer rubrum	Shrub	FAC	3
Rubus argutus	Herbaceous	FACU	25
Dichanthelium dichotomum	Herbaceous	FAC	10
Lonicera japonica	Vine	FACU	5

Non-Dominant Species	Stratum	IND	%
Andropogon virginicus	Herbaceous	FACU	3
Rosa multiflora	Herbaceous	FACU	3

% Dominant species FAC or wetter: 40%

Prevalence Index: 3.8

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation:
Dominance Test >50%:
Prevalence Index is ≤ 3.0:
Morphological Adaptations:
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER NOT MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-2	2.5Y 5/4	100					SANDY LOAM
2-20	7.5YR 4/6	100					CLAY LOAM

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	___ Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type:
Depth (inches):

Remarks: **SOIL PARAMETER NOT MET.**

Received by VMRC February 4, 2021 /blh

Wetland Determination Data Form - Eastern Mountains and Piedmont Region

Sampling Point Number: 9

Stantec

Project:	WILDWOOD SUBSTATION		
Applicant:	NORTHERN VIRGINIA ELECTRIC COOPERATIVE	Section/Township/Range:	N/A
City/County:	LOUDOUN COUNTY	Subregion (LRR or MLRA):	LRR S
State:	VIRGINIA	Site Latitude:	39.046780°
Investigator(s):	B. YOUNG	Site Longitude:	-77.540235°
Date:	8/17/2018	Soil Map Unit Name:	ELBERT SILTY CLAY LOAM

Summary of Findings: **WETLAND NEAR FLAG BYL-116;**

Hydrophytic Vegetation is Present:	X	Normal Circumstances:	X	NWI Classification:	N/A
Hydric Soils are Present:	X	Disturbed Parameters (see Remarks):		Local Relief:	CONCAVE
Wetland Hydrology is Present:	X	Problematic Parameters (see Remarks):		Landform:	DRAINAGEWAY
Sampled Area is within a Wetland:	X	Atypical Climate/Hydrology (see Remarks):		Slope %:	1-2

Hydrology Parameter:

Primary Indicators:		***Secondary Indicators:***
___ Surface Water (A1)	___ Water Stained Leaves (B9)	___ Surface Soil Cracks (B6)
___ High Water Table (A2)	___ Aquatic Fauna (B13)	___ Sparsely Vegetated Concave Surface (B8)
X Saturation (A3)	___ True Aquatic Plants (B14)	___ Drainage Patterns (B10)
___ Water Marks (B1)	___ Hydrogen Sulfide Odor (C1)	___ Moss Trim Lines (B16)
___ Sediment Deposits (B2)	___ Oxidized Rhizospheres on Living Roots (C3)	___ Dry-Season Water Table (C2)
___ Drift Deposits (B3)	___ Presence of Reduced Iron (C4)	___ Crayfish Burrows (C8)
___ Algal Mat or Crust (B4)	___ Recent Iron Reduction in Tilled Soils (C6)	___ Saturation Visible on Aerial Imagery (C9)
___ Iron Deposits (B5)	___ Thin Muck Surface (C7)	___ Stunted or Stressed Plants (D1)
___ Inundation Visible on Aerial Imagery (B7)	___ Other	___ Geomorphic Position (D2)
		___ Shallow Aquitard (D3)
		___ Microtopographic Relief (D4)
		X FAC-Neutral Test (D5)

Water Depths (inches):
Surface Water: ___
Water Table: ___
Saturated soil: 1

Remarks: **HYDROLOGY PARAMETER MET.**

Vegetation Parameter:

Dominant Species	Stratum	IND	%
Juncus effusus	Herbaceous	FACW	15
Carex lurida	Herbaceous	OBL	10

Non-Dominant Species	Stratum	IND	%
Scirpus cyperinus	Herbaceous	FACW	5
Persicaria pensylvanica	Herbaceous	FACW	5
Ludwigia alternifolia	Herbaceous	FACW	3
Rubus argutus	Herbaceous	FACU	3

% Dominant species FAC or wetter: 100%

Prevalence Index: 1.9

NOTE: SPECIES INDICATOR STATUS ACCORDING TO 2016 NATIONAL WETLAND PLANT LIST

Calculated using all species present.

Rapid Test for Hydrophytic Vegetation: **X**
Dominance Test >50%: **X**
Prevalence Index is ≤ 3.0: **X**
Morphological Adaptations: ___
Problematic Hydrophytic Vegetation:

Remarks: **VEGETATION PARAMETER MET.**

Soil Parameter:

	Matrix		Redox Features				
Depth (inches)	**Color (Moist)**	**%**	**Color (Moist)**	**%**	**Type**	**Loc**	**Texture**
0-6	7.5YR 4/6	100					CLAY LOAM
6-20	10YR 4/2	85	10YR 4/4	10	C	M	CLAY LOAM
			7.5YR 5/3	5	C	M	

Hydric Soil Indicators:

			Indicators for Problematic Hydric Soils
___ Histosol (A1)	___ Sandy Mucky Mineral (S1)	X Depleted Matrix (F3)	___ 2cm Muck (A10)
___ Histic Epipedon (A2)	___ Sandy Gleyed Matrix (S4)	___ Redox Dark Surface (F6)	___ Coast Prairie Redox (A16)
___ Black Histic (A3)	___ Sandy Redox (S5)	___ Depleted Dark Surface (F7)	___ Piedmont Floodplain Soils (F19)
___ Hydrogen Sulfide (A4)	___ Stripped Matrix (S6)	___ Redox Depressions (F8)	___ Red Parent Material (TF2)
___ Stratified Layers (A5)	___ Dark Surface (S7)	___ Iron-Manganese Masses (F12)	___ Very Shallow Dark Surface (TF12)
___ 2 cm Muck (A10)	___ Polyvalue Below Surface (S8)	___ Umbric Surface (F13)	___ Other
___ Depleted Below Dark Surface (A11)	___ Thin Dark Surface (S9)	___ Piedmont Floodplain Soils (F19)	
___ Thick Dark Surface (A12)	___ Loamy Gleyed Matrix (F2)		

Restrictive Layer (If Observed)
Type: ___
Depth (inches): ___

Remarks: **SOIL PARAMETER MET.**

Received by VMRC February 4, 2021 /blh

APPENDIX E – THREATENED AND ENDANGERED SPECIES

Received by VMRC February 4, 2021 /blh

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Virginia Field Office
6669 Short Lane
Gloucester, VA 23061

Date: 02/01/2019

Self-Certification Letter

Project Name: Wildwood Substation

Dear Applicant:

Thank you for using the U.S. Fish and Wildlife Service (Service) Virginia Ecological Services online project review process. By printing this letter in conjunction with your project review package, you are certifying that you have completed the online project review process for the project named above in accordance with all instructions provided, using the best available information to reach your conclusions. This letter, and the enclosed project review package, completes the review of your project in accordance with the Endangered Species Act of 1973 (16 U.S.C. . 1531-1544, 87 Stat. 884), as amended (ESA), and the Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c, 54 Stat. 250), as amended (Eagle Act). This letter also provides information for your project review under the National Environmental Policy Act of 1969 (P.L. 91-190, 42 U.S.C. 4321-4347, 83 Stat. 852), as amended. A copy of this letter and the project review package must be submitted to this office for this certification to be valid. This letter and the project review package will be maintained in our records.

The species conclusions table in the enclosed project review package summarizes your ESA and Eagle Act conclusions. These conclusions resulted in:

- "no effect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- "may affect, not likely to adversely affect" determinations for proposed/listed species and/or proposed/designated critical habitat; and/or
- "may affect, likely to adversely affect" determination for the Northern long-eared bat (*Myotis septentrionalis*) and relying on the findings of the January 5, 2016 Programmatic Biological Opinion for the Final 4(d) Rule on the Northern long-eared bat; and/or
- "no Eagle Act permit required" determinations for eagles.

Received by VMRC February 4, 2021 /blh

We certify that use of the online project review process in strict accordance with the instructions provided as documented in the enclosed project review package results in reaching the appropriate determinations. Therefore, we concur with the "no effect" or "not likely to adversely affect" determinations for proposed and listed species and proposed and designated critical habitat; the "may affect" determination for Northern long-eared bat; and/or the "no Eagle Act permit required" determinations for eagles. Additional coordination with this office is not needed.

Candidate species are not legally protected pursuant to the ESA. However, the Service encourages consideration of these species by avoiding adverse impacts to them. Please contact this office for additional coordination if your project action area contains candidate species.

Should project plans change or if additional information on the distribution of proposed or listed species, proposed or designated critical habitat, or bald eagles becomes available, this determination may be reconsidered. This certification letter is valid for 1 year.

Information about the online project review process including instructions and use, species information, and other information regarding project reviews within Virginia is available at our website http://www.fws.gov/northeast/virginiafield/endspecies/project_reviews.html. If you have any questions, please contact Troy Andersen of this office at (804) 824-2428.

Sincerely,

Cindy Schulz
Field Supervisor
Virginia Ecological Services

Enclosures - project review package

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To:
Consultation Code: 05E2VA00-2019-SLI-1757
Event Code: 05E2VA00-2020-E-16832
Project Name: Wildwood Substation

September 10, 2020

Subject: Updated list of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2019-SLI-1757

Event Code: 05E2VA00-2020-E-16832

Project Name: Wildwood Substation

Project Type: ** OTHER **

Project Description: Construction of a power substation

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/39.047256940619036N77.54153985687964W

Counties: Loudoun, VA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

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1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: February 21, 2020
Consultation Code: 05E2VA00-2019-TA-1757
Event Code: 05E2VA00-2020-E-05904
Project Name: Wildwood Substation

Subject: Verification letter for the 'Wildwood Substation' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Amber Forestier:

The U.S. Fish and Wildlife Service (Service) received on February 21, 2020 your effects determination for the 'Wildwood Substation' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

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[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

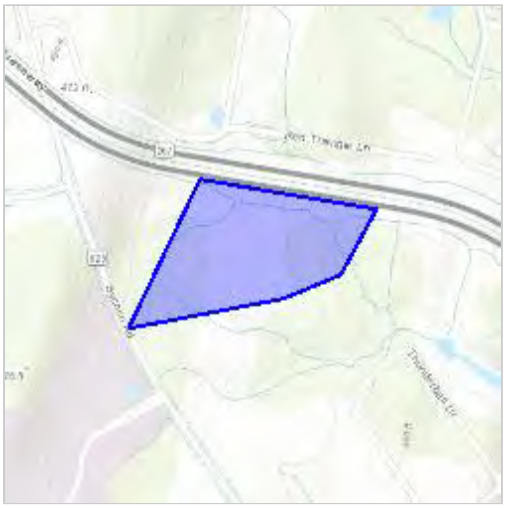
Wildwood Substation

2. Description

The following description was provided for the project 'Wildwood Substation':

> Construction of a power substation

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/39.047256940619036N77.54153985687964W



Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service's PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR §17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases and other sources of information on the locations of northern long-eared bat roost trees and hibernacula is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

   No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

   No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

    No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type '0' in questions 1-3.

1. Estimated total acres of forest conversion:

12

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type '0' in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type '0' in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type '0' in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To:
Consultation Code: 05E2VA00-2019-SLI-1757
Event Code: 05E2VA00-2019-E-03992
Project Name: Wildwood Substation

February 01, 2019

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered

species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 05E2VA00-2019-SLI-1757

Event Code: 05E2VA00-2019-E-03992

Project Name: Wildwood Substation

Project Type: ** OTHER **

Project Description: Construction of a power substation

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/39.047256940619036N77.54153985687964W

Counties: Loudoun, VA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

COMMONWEALTH of VIRGINIA
DEPARTMENT OF CONSERVATION AND RECREATION

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

January 2, 2019

Jake Holmes
Dewberry, Inc.
13575 Heathcote Boulevard
Gainesville, VA 20155

Re: Wildwood Substation

Dear Mr. Holmes:

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit a completed order form and project map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

A fee of $90.00 has been assessed for the service of providing this information. Please find attached an invoice for that amount. Please return one copy of the invoice along with your remittance made payable to the Treasurer of Virginia, DCR Finance**,** 600 East Main Street, 24th Floor, Richmond, VA 23219**.** Payment is due within thirty days of the invoice date. Late payment may result in the suspension of project review service for future projects.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov. According to the information currently in our files, Goose Creek, which has been designated by VDGIF as a "Threatened and Endangered Species Water" for the Green floater, is within 2 miles of the project area. Therefore, DCR recommends

coordination with VDGIF, Virginia's regulatory authority for the management and protection of this species to ensure compliance with protected species legislation.

Should you have any questions or concerns, feel free to contact me at 804-371-2708. Thank you for the opportunity to comment on this project.

Sincerely,

S. René Hypes
Natural Heritage Project Review Coordinator

Cc: Ernie Aschenbach, VDGIF

VaFWIS Initial Project Assessment Report Compiled on 2/14/2020, 3:55:24 PM

Help

Known or likely to occur within a **2 mile radius around point 39.0464870 -77.5408648** in **107 Loudoun County, VA**

View Map of Site Location

489 Known or Likely Species ordered by Status Concern for Conservation
(displaying first 26) (26 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060003	FESE	Ia	Wedgemussel, dwarf	Alasmidonta heterodon		BOVA
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
060029	FT	IIa	Lance, yellow	Elliptio lanceolata		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
060006	SE	Ib	Floater, brook	Alasmidonta varicosa		BOVA
030062	ST	Ia	Turtle, wood	Glyptemys insculpta		BOVA,Habitat
040096	ST	Ia	Falcon, peregrine	Falco peregrinus		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
040379	ST	Ia	Sparrow, Henslow's	Centronyx henslowii		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes	BOVA,TEWaters,Habitat
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030063	CC	IIIa	Turtle, spotted	Clemmys guttata		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA
040092		Ia	Eagle, golden	Aquila chrysaetos		BOVA
040306		Ia	Warbler, golden-winged	Vermivora chrysoptera		BOVA
100248		Ia	Fritillary, regal	Speyeria idalia idalia		BOVA
040213		Ic	Owl, northern saw-whet	Aegolius acadicus		BOVA
040052		IIa	Duck, American black	Anas rubripes		BOVA
040036		IIa	Night-heron, yellow-crowned	Nyctanassa violacea violacea		BOVA
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA
040140		IIa	Woodcock, American	Scolopax minor		BOVA
060071		IIa	Lampmussel, yellow	Lampsilis cariosa		BOVA
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA
040105		IIb	Rail, king	Rallus elegans		BOVA
100166		IIc	Skipper, Dotted	Hesperia attalus slossonae		BOVA

To view **All 489 species** View 489

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need;
III=VA Wildlife Action Plan - Tier III - High Conservation Need; IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters (13 Reaches)

View Map of All Threatened and Endangered Waters

Stream Name	T&E Waters Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Goose Creek (022447)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes

Goose Creek (022535)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (023151)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (025464)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (026509)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (026603)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (027795)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (028846)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (030915)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (030932)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (032895)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (034177)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Goose Creek (034352)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes

Managed Trout Streams

N/A

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Habitat Predicted for Aquatic WAP Tier I & II Species (5 Reaches)

View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species

Stream Name	Tier Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Beaverdam Creek (20700081)	ST	030062	ST	Ia	Turtle, wood	Glyptemys insculpta	Yes
Beaverdam Run (20700081)	ST	030062	ST	Ia	Turtle, wood	Glyptemys insculpta	Yes
Goose Creek (20700081)	ST	060081	ST	IIa	Floater, green	Lasmigona subviridis	Yes
Sycolin Creek (20700081)	ST	030062	ST	Ia	Turtle, wood	Glyptemys insculpta	Yes
tributary (20700081)	ST	030062	ST	Ia	Turtle, wood	Glyptemys insculpta	Yes
tributary (20700081)	ST	030062	ST	Ia	Turtle, wood	Glyptemys insculpta	Yes

Habitat Predicted for Terrestrial WAP Tier I & II Species

N/A

Public Holdings:

N/A

Compiled on 2/14/2020, 3:55:24 PM I1015702.0 report=IPA searchType= R dist= 3218 poi= 39.0464870 -77.5408648

PixelSize=64; Anadromous=0.023744; BECAR=0.024459; Bats=0.023455; Buffer=0.095652; County=0.082894; Impediments=0.030915; Init=0.152049; PublicLands=0.026515; SppObs=0.183954; TEWaters=0.043136; TierReaches=0.060463; TierTerrestrial=0.038962; Total=0.932818; Tracking_BOVA=0.196866; Trout=0.025935

Received by VMRC February 4, 2021 /blh

VaFWIS - Department of Game and Inland Fisheries

39.04648 -77.54086
is the Search Point
Submit Cancel

Search Point
- **Change** to "clicked" map point
- **Fixed** at 39.04648 -77.54086

Show Position Rings
Yes No
1 mile and 1/4 mile at the **Search Point**

Show Search Area
Yes No
2 Search distance miles radius

Search Point is at map center

Base Map Choices
Topography

Map Overlay Choices
Current List: Position, Search

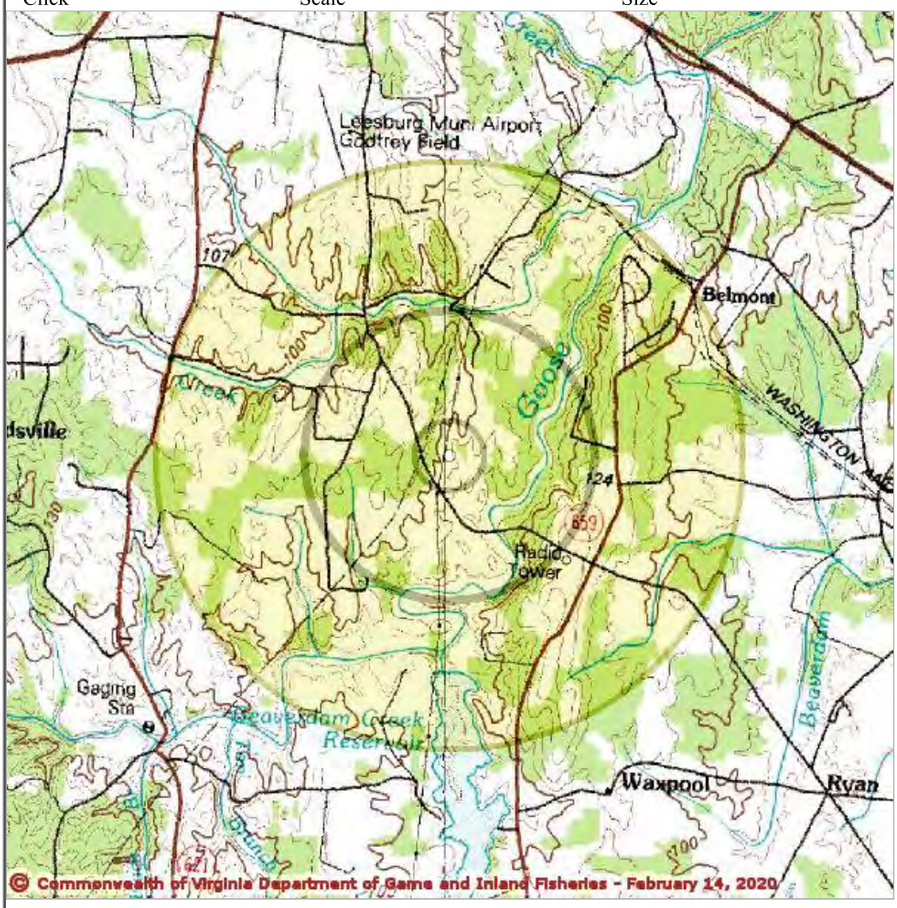
Map Overlay Legend

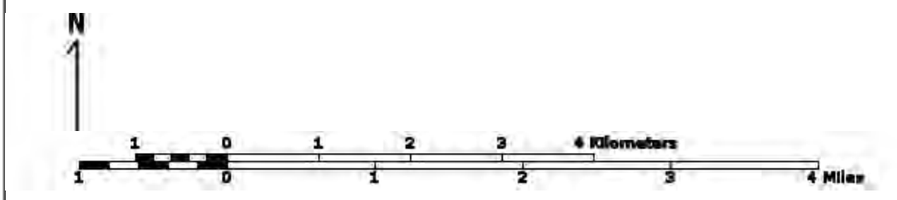
Position Rings 1 mile and 1/4 mile at the Search Point

2 mile radius Search Area

Refresh Browser Page

Map Click Pan Id M Map Scale In Zoom Out Screen Size Small Size Big Help





Point of Search 39.04648 -77.54086
Map Location 39.04648 -77.54086

Select **Coordinate System:**
- Degrees,Minutes,Seconds Latitude - Longitude
- Decimal Degrees Latitude - Longitude
- Meters UTM NAD83 East North Zone
- Meters UTM NAD27 East North Zone

Base Map source: USGS 1:100,000 topographic maps (see Microsoft terraserver-usa.com for details)

Map projection is UTM Zone 18 NAD 1983 with left 275313 and top 4329808. Pixel size is 16 meters . Coordinates displayed are decimal Degrees North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixles. The map display represents 9600 meters east to west by 9600 meters north to south for a total of 92.1 square kilometers. The map display represents 31501 feet east to west by 31501 feet north to south for a total of 35.5 square miles.

Topographic maps and Black and white aerial photography for year 1990+-
are from the United States Department of the Interior, United States Geological Survey.
Color aerial photography aquired 2002 is from Virginia Base Mapping Program, Virginia Geographic Information Network.
Shaded topographic maps are from TOPO! ©2006 National Geographic http://www.national.geographic.com/topo
All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.

map assembled 2020-02-14 16:25:47 (qa/qc March 21, 2016 12:20 - tn=1015709 dist=3218 I)
$poi=39.0464870 -77.5408645

TE Waters Group
Goose Creek (022535)

39,02,47.3 -77,32,27.1
is **the Search Point**

Display	**Item Location** is
at center	not at map center

Show Position Rings
Yes No
1 mile and 1/4 mile at the **Search Point**

Show Search Area
Yes No
2 Search distance miles radius

Search Point is at map center

Base Map Choices
Topography

Map Overlay Choices
Current List: Position, Search, Observation

Map Overlay Legend

T & E Waters
Federal
Selected Federal
State
Selected State

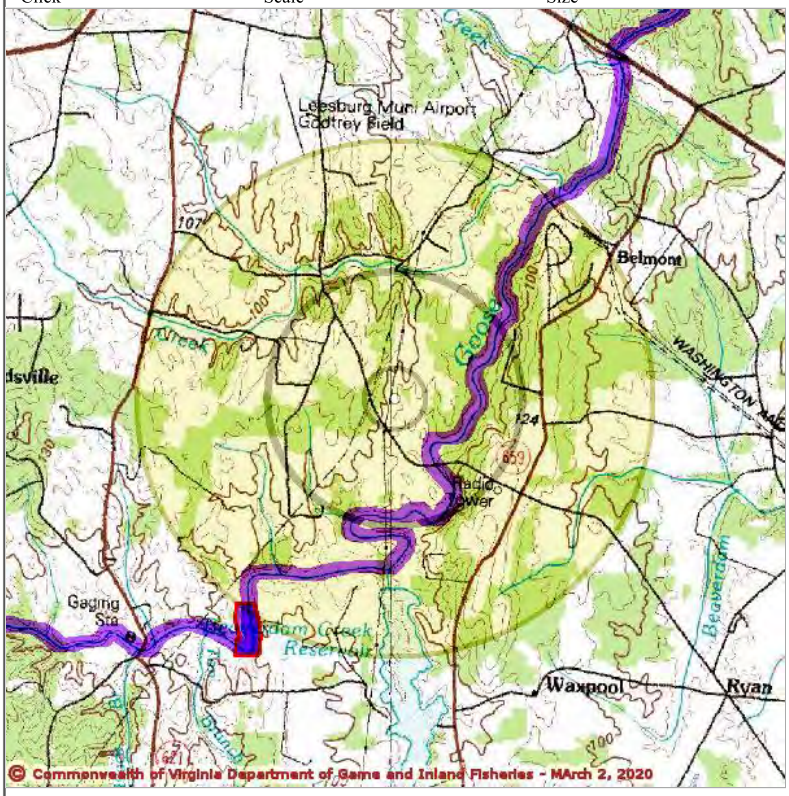
Position Rings
1 mile and 1/4 mile at the Search Point

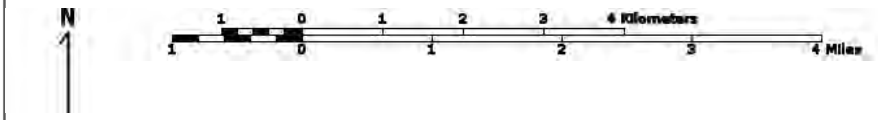
2 mile radius Search Area

Data Observation Site

Refresh Browser Page

Map Click Pan Id M Map Scale In Zoom Out Screen Size Small Size Big Help





Point of Search 39,02,47.3 -77,32,27.1
Map Location 39,02,47.3 -77,32,27.1

Select **Coordinate System:**
- Degrees,Minutes,Seconds Latitude - Longitude
- Decimal Degrees Latitude - Longitude
- Meters UTM NAD83 East North Zone
- Meters UTM NAD27 East North Zone

Base Map source: USGS 1:100,000 topographic maps (see Microsoft terraserver-usa.com for details)

Map projection is UTM Zone 18 NAD 1983 with left 275313 and top 4329808. Pixel size is 16 meters . Coordinates displayed are Degrees, Minutes, Seconds North and West. Map is currently displayed as 600 columns by 600 rows for a total of 360000 pixles. The map display represents 9600 meters east to west by 9600 meters north to south for a total of 92.1 square kilometers. The map display represents 31501 feet east to west by 31501 feet north to south for a total of 35.5 square miles.

Topographic maps and Black and white aerial photography for year 1990+-
are from the United States Department of the Interior, United States Geological Survey.
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http://www.national.geographic.com/topo
All other map products are from the Commonwealth of Virginia Department of Game and Inland Fisheries.

map assembled 2020-03-02 10:29:16 (qa/qc March 21, 2016 12:20 - tn=1018025.0 dist=3218 I)
$poi=39.0464870 -77.5408646$query=select Convert(varchar(10),floor((minx+maxx)/2)) + ' ' + Convert(varchar(10),floor((miny+maxy)/2)) from vafwis_tables.dbo.cvTEWaters where SEG_ID in (022447)

Natural Heritage Resources

Your Criteria

Taxonomic Group: Select All

Federal Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened

State Legal Status: LE - Listed endangered,LT - Listed threatened,PE - Proposed endangered,PT - Proposed threatened

County: Loudoun

Physiographic Province: Northern Piedmont

Watershed (8 digit HUC): 02070008 - Middle Potomac-Cactoctin

Subwatershed (12 digit HUC): PL14 - Goose Creek-Big Branch

Planning District: Northern Virginia

Virginia Coastal Zone: No

Search Run: 2/14/2020 16:01:55 PM

Result Summary

Total Species returned: 1

Total Communities returned: 0

Click scientific names below to go to NatureServe report.

Click column headings for an explanation of species and community ranks.

Common Name/Natural Community	Scientific Name	Scientific Name Linked	Global Conservation Status Rank	State Conservation Status Rank	Federal Legal Status	State Legal Status	Statewide Occurrences	Virginia Coastal Zone
Loudoun								
Northern Piedmont								
Middle Potomac-Catoctin								
Goose Creek-Big Branch								
Northern Virginia								
BIRDS								
Loggerhead Shrike	Lanius ludovicianus	Lanius ludovicianus	G4	S1B,S2N	None	LT	41	N

Note: On-line queries provide basic information from DCR's databases at the time of the request. They are NOT to be substituted for a project review or for on-site surveys required for environmental assessments of specific project areas.

For Additional Information on locations of Natural Heritage Resources please submit an information request.

To Contribute information on locations of natural heritage resources, please fill out and submit a rare species sighting form.

USFWS Species Conclusions Table

Project Name: Wildwood Substation

Date: February 2, 2019 (Updated review September 10, 2020)

Species / Resource Name	Conclusion	ESA Section 7	Notes / Documentation
Northern Long-eared Bat *(Myotis septentrionalis)*	Potential habitat present and no current survey conducted	May affect	DKey Source: USFWS IPaC; VDGIF NLEB map
Critical Habitat	There is no critical habitat present	No effect	 Source: Virginia Field Office Critical Habitat Mapping Tool

State of Virginia Endangered and Threatened Species (4VAC15-20-130) Conclusions Table

Project Name: Wildwood Substation

Date: February 2, 2019 (Updated review February 21, 2020)

Species / Resource Name	Conclusion	Determination	Notes / Documentation
Green Floater (*Lasmigona subviridis*)	No suitable habitat present	Not likely to adversely affect	Project area contains only smaller headwater streams, with steep topography displaying hydrological regimes that likely would not support the species. Confirmed observations have all been within Goose Creek, which is separated from this site by a pond.
Loggerhead Shrike (*Lanius ludovicianus*)	No suitable habitat present	Not likely to adversely affect	Staff ecologist has determined that there is no potential habitat present on-site.

APPENDIX F – CULTURAL RESOURCES

Received by VMRC February 4, 2021 /blh

Phase I Archaeological Survey of Approximately 27.59 Acres Associated with the Proposed Wildwood Substation, Loudoun County, Virginia

VDHR File No. TBD

March 8, 2019

Prepared for:

NOVEC
Attn: Mr. George Coutts
5399 Willington Branch Drive
Gainesville VA 20155

Prepared by:

Donald Sadler, Project Archaeologist

and

Brynn Stewart, Senior Principal Investigator

Stantec Consulting Services Inc.
1011 Boulder Springs Drive, Suite 225
Richmond VA 23225
(804) 267-3474

PHASE I ARCHAEOLOGICAL SURVEY OF APPROXIMATELY 27.59 ACRES ASSOCIATED WITH THE PROPOSED WILDWOOD SUBSTATION, LOUDOUN COUNTY, VIRGINIA

This document entitled Phase I Archaeological Survey of Approximately 27.59 Acres Associated with the Proposed Wildwood Substation, Loudoun County, Virginia was prepared by Stantec Consulting Services Inc. ("Stantec") for the account of Northern Virginia Electric Cooperative (NOVEC) (the "Client"). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec's professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by  _____
(signature)
Donald Sadler, Project Archaeologist

Reviewed by  _____
(signature)
Brynn Stewart, Senior Principal Investigator

Approved by _____
(signature)
Loretta Cummings, PhD, Senior Regulatory Specialist

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Received by VMRC February 4, 2021 /blh

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

Executive Summary

From February 5–7, 2019, Stantec Consulting Services Inc. (Stantec) conducted an archaeological survey of approximately 27.59 acres associated with the proposed Wildwood Substation in Loudoun County, Virginia. The project area is located south of Dulles Greenway (Route 267) and east and northeast from Sycolin Road (Route 643) and is comprised of a wooded parcel with a cleared transmission line corridor forming the western boundary of the parcel. One previously identified archaeological site (44LD0468) is located within the bounds of the project area. The site, a prehistoric lithic scatter of indeterminate temporal affiliation, has not been formally evaluated for National Register of Historic Places (NRHP) eligibility. The work was conducted at the request of the Northern Virginia Electric Cooperative (NOVEC).

The Phase I survey was designed to locate and identify cultural resources within the defined project area and to obtain sufficient information to make recommendations regarding their potential eligibility for listing in the NRHP. The overall project area encompassed approximately 27.59 acres in extent. However, a preliminary environmental review was conducted in May of 2018, and identified approximately 8.87 acres of wetlands and document approximately 5.28 acres of actual wetland. As a result, only approximately 22.31 acres of the project area were subject to systematic survey.

Phase I survey included pedestrian survey of the entire project area, minus wetlands, conducted concurrently with systematic subsurface testing. A total of 336 shovel tests were excavated within the project area at 50-foot intervals along 27 transects (Transects A–AA) spaced 50 feet apart. A total of 144 shovel tests were not excavated due primarily to their location within wetlands, standing water, roads, push piles, and other surface disturbances. Three shovel tests were positive for cultural material and a total of eight radial shovel tests were excavated at 25-foot intervals around positive tests to determine the boundaries of newly identified cultural resources. One radial shovel test was positive for additional cultural material. One new isolated archaeological find (1129-IF1) was identified during this investigation. One previously recorded archaeological site (44LD0468) was reidentified. ***By definition, isolated archaeological finds are not eligible for NRHP inclusion.*** Site 44LD0468 was recorded in 1990 as a prehistoric lithic scatter of indeterminate temporal affiliation. The current survey identified one flake in the site vicinity, resulting in the expansion of the site boundary. Given the paucity of artifacts recovered, the lack of diagnostic material, and the location of the site within wetlands, ***Stantec recommends Site 44LD0468 as not eligible for listing on the NRHP under Criterion D; Criteria A through C were not considered applicable to the evaluation of this resource. No further archaeological work is recommended for the proposed Wildwood Substation project area.***

Recommendations for Cultural Resources in the Project Area

Resource	Resource Type	Association	Stantec Recommendation
1129-IF1	2 Quartz Flakes	Prehistoric Unknown	Not Eligible; No Further Work
44LD0468	Lithic Scatter	Prehistoric Unknown	Not Eligible; No Further Work

Abbreviations

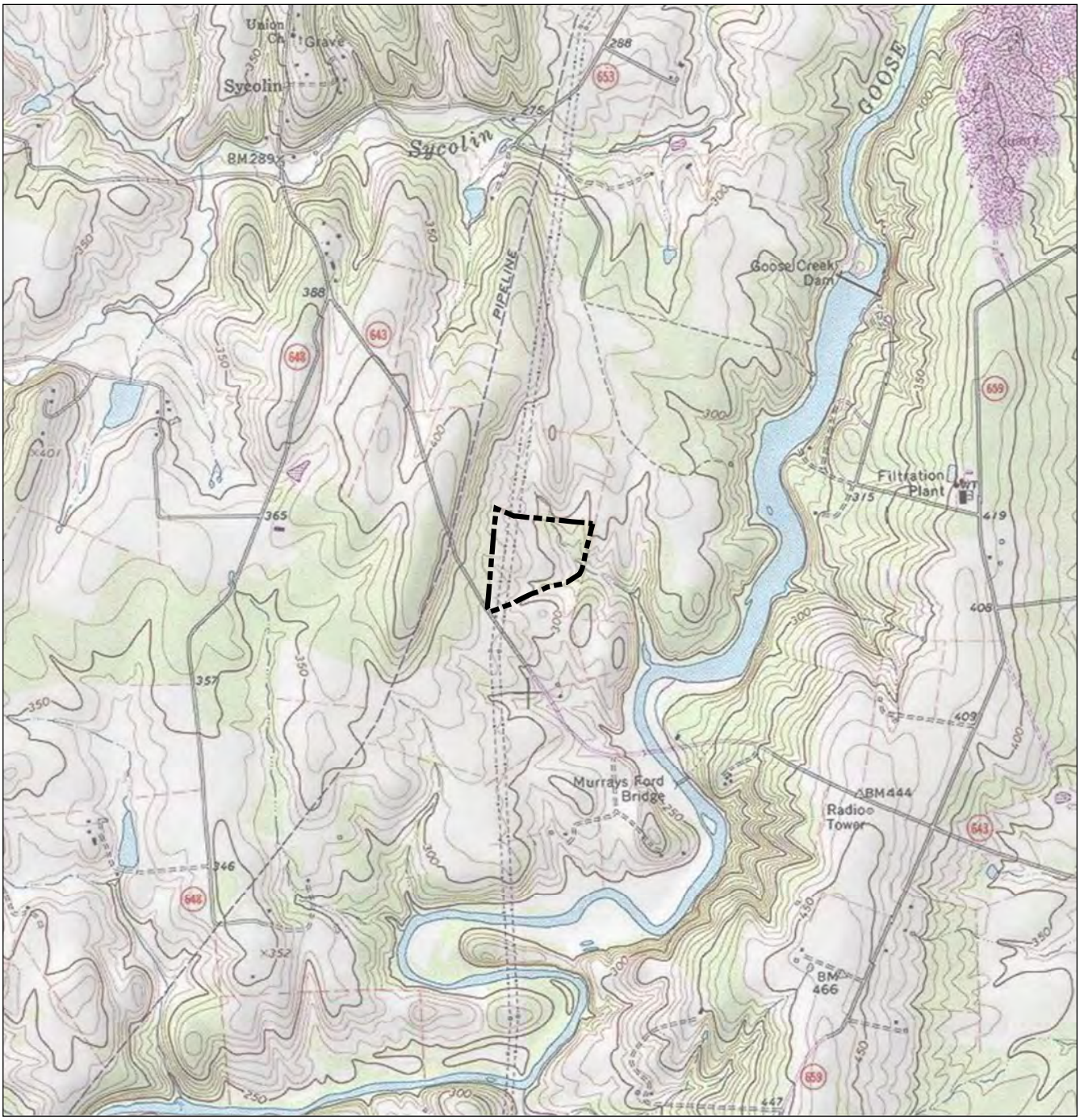
amsl	above mean sea level
CCR	Coastal Carolina Research, Inc.
Circa	Circa~ Cultural Resources Management LLC
CRI	Cultural Resources, Inc.
DCR	Department of Conservation and Recreation
DEQ	Department of Environmental Quality
MAAR	Mid-Atlantic Research Associates, Inc.
NHPA	National Historic Preservation Act
NOVEC	Northern Virginia Electric Cooperative
NRHP	National Register of Historic Places
Stantec	Stantec Consulting Services Inc.
STP	shovel test pit
USDI	United States Department of the Interior
USGS	United States Geological Survey
V-CRIS	Virginia Cultural Resource Information System
VDHR	Virginia Department of Historic Resources
VLR	Virginia Landmarks Register

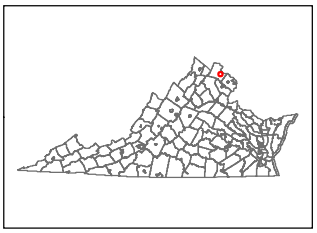
1.0 INTRODUCTION

From February 5–7, 2019, Stantec Consulting Services Inc. (Stantec) conducted an archaeological survey of approximately 27.59 acres associated with the proposed Wildwood Substation in Loudoun County, Virginia. The project area was located south of Dulles Greenway (Route 267) and east northeast of Sycolin Road (Route 643) and was comprised of a wooded parcel with a cleared transmission line corridor forming the western boundary of the parcel (Figure 1). One previously identified archaeological site (44LD0468) was located within the bounds of the project area. This site is primarily prehistoric in nature and has not been formally evaluated for National Register of Historic Places (NRHP) eligibility. The work was conducted at the request of the Northern Virginia Electric Cooperative (NOVEC).

All cultural resources services described herein are pursuant to the National Historic Preservation Act of 1966, as amended, the Archeological and Historic Preservation Act of 1974, Executive Order 11593, relevant sections of 36 CFR 60 and 36 CFR 800. The Stantec Principal Investigator and Project Archaeologist directing this survey meet the professional qualification standards of the Department of the Interior (48 FR 44738-9). The archaeological fieldwork component of these investigations conforms to the qualifications specified in the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (Federal Register 48:44716-44742, September 29, 1983), and the VDHR's *Guidelines for Conducting Historic Resource Survey in Virginia* (2017). All artifacts generated during survey and associated records are curated according to the requirements specified in Curation of Federally Owned and Administered Archaeological Collections (36 CFR Part 79) and the VDHR's State Curation Standards.

Senior Principal Investigator Brynn Stewart provided general direction and the research strategy for the project. Project Archaeologist Donald Sadler co-authored the report with Ms. Stewart. Crew Chief Emily Swain directed the fieldwork with assistance from Archaeological Field Technicians Ashley Bocan and Patrick Mumma. Artifact analysis was conducted by Laboratory Director Emily Curme. Copies of all field notes, maps, correspondence, and historical research materials are on file at Stantec's main office in Richmond, Virginia.





Project Limits

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(At original document size of 8.5x11)
1:24,000

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Stantec

Notes
1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. Topographic map © USGS 7.5 Minute Series Topographic Map

Project Location
Loudoun County, Virginia

Prepared by ECL on 2019-02-08
TR by TPS on 2019-02-19
IR by BSS on 2019-02-15

Client/Project
NOVEC
Wildwood Substation

203401129

Figure No.
1

Title
Project Location Map

Page 1.2

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2.0 PHYSICAL AND ENVIRONMENTAL CONTEXT

2.1 INTRODUCTION

The project area is located in a wooded parcel south of Dulles Greenway (Route 267). The project area is bounded on the east and west by woodland and on the south by an agricultural field and Sycolin Road (Route 643). A cleared transmission line corridor comprises the western edge of the parcel. Wetlands are present in the southwest corner and along the northern edge of the project area.

2.2 GEOLOGY AND TOPOGRAPHY

The project area is located within the Outer Piedmont subprovince of the Piedmont physiographic province. In general, this province has an undulating topography with broad rolling hills and moderate slopes with drainage patterns ultimately feeding the Potomac River. The project area is situated on the Culpepper Basin which is comprised of sedimentary rocks and sedimentary-derived metamorphic rocks, both of which may include intrusions of dense, igneous diabase rock (Loudoun County 2013). Elevations within the project area range from approximately 273 to 322 feet above mean sea level (amsl).

2.3 HYDROLOGY

The project area is drained by Goose Creek. Goose Creek is a tributary of the Potomac River which flows into the Chesapeake Bay and thence to the Atlantic Ocean.

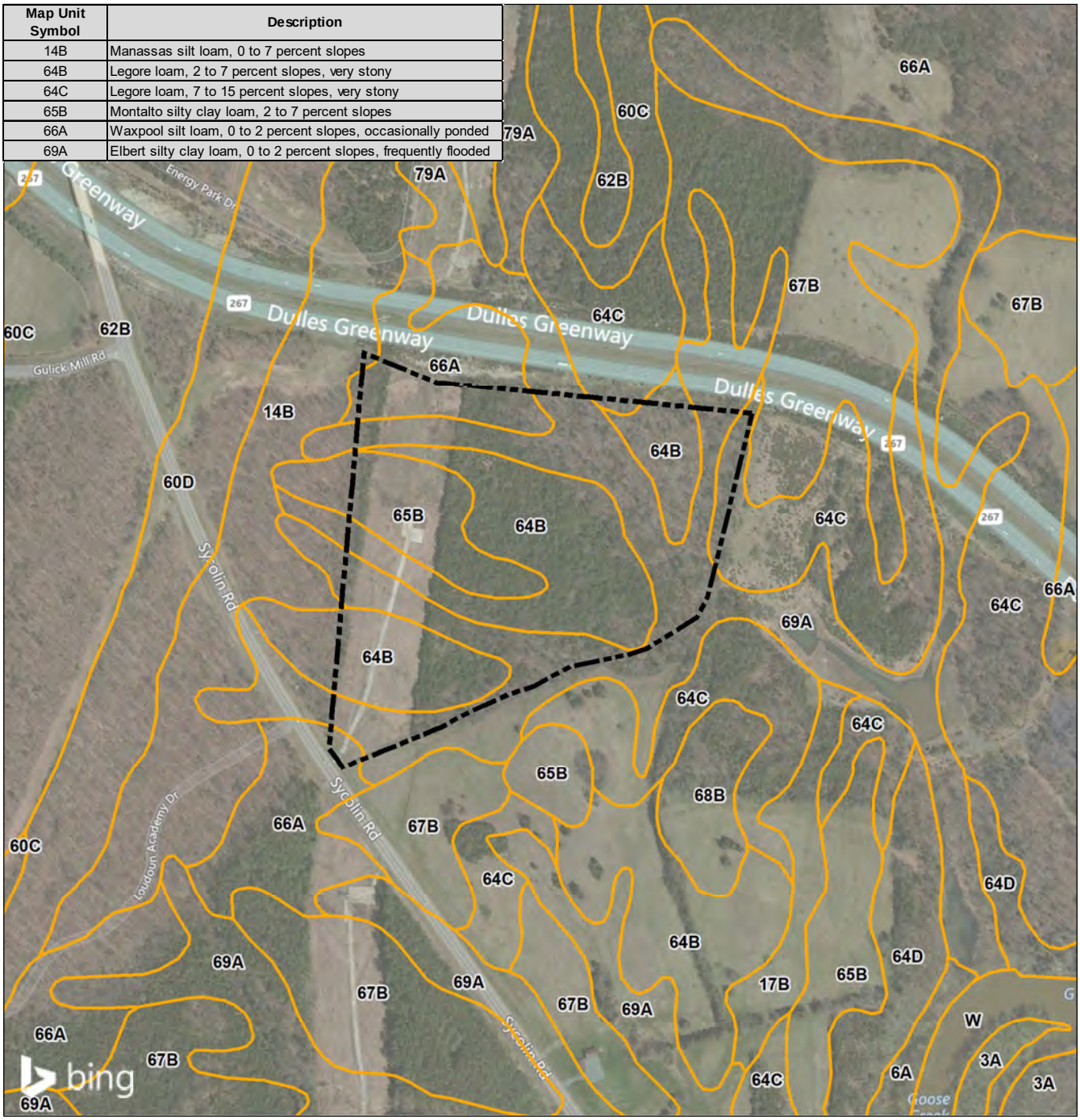
2.4 SOIL MORPHOLOGY

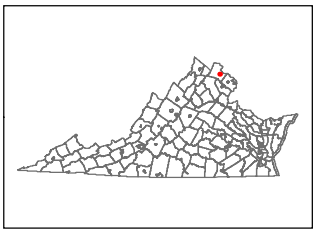
Soils within the project area consist primarily of silty clay loams and ranged from poorly to well drained. Slopes range from 0 to 15 percent with the majority ranging from 2 to 7 percent. Table 1 presents the soil types found within the project area and serves as a key to Figure 2.

Table 1. Key to the Soils Map

Symbol	Map Unit Name	Percent Slope	Drainage Description
64B	Legore loam	2-7%	Well Drained
64C	Legore loam	7-15%	Well Drained
65B	Montalto silty clay loam	2-7%	Well Drained
66A	Waxpool silt loam	0-2%	Poorly Drained
69A	Elbert silty clay loam	0-2%	Poorly Drained

Map Unit Symbol	Description
14B	Manassas silt loam, 0 to 7 percent slopes
64B	Legore loam, 2 to 7 percent slopes, very stony
64C	Legore loam, 7 to 15 percent slopes, very stony
65B	Montalto silty clay loam, 2 to 7 percent slopes
66A	Waxpool silt loam, 0 to 2 percent slopes, occasionally ponded
69A	Elbert silty clay loam, 0 to 2 percent slopes, frequently flooded





Project Limits
Soils

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Stantec

Notes
1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. Data Sources: USDA NRCS SSURGO Soil Survey
3. Orthoimagery © Bing Maps
4. Microsoft product screen shot(s) reprinted with permission from Microsoft Corporation

Project Location
Loudoun County, Virginia

Prepared by ECL on 2019-02-08
TR by TPS on 2019-02-19
IR by BSS on 2019-02-15

Client/Project
NOVEC
Wildwood Substation

203401129

Figure No.
2

Title
Soils Map

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2.5 NATURAL RESOURCES

Loudoun County's forests historically included many varieties of oak and included common, swamp, box, and chestnut-leaved. In addition, black, red, chestnut, peach, pin, dwarf, and Spanish oak, peach or willow oak, and black jack or barren oak also grew in the county. Walnut, poplar, chestnut, locust, ash, sycamore, wild cherry, maple, gum, sassafras, persimmon, dogwood, elm, mulberry, beech, birch, linn, honey-locust, pine, hemlock, red cedar, and, rarely, aspen constituted portions of woodlands as well (Head 1908:67-68). The county's streams drew waterfowl to the area, and beaver and otter also ranged along the stream bottoms. Game birds, notably turkey, pheasant, partridge, and woodcock, inhabited the forests and grasslands, as did eagles, hawks, buzzards, and various songbirds. Red and gray fox, raccoons, opossum, woodchucks, squirrels, and rabbits were important among the smaller animals in the county. With the decline of bear and elk, the predominance of deer in the region increased (Head 1908:68-69).

3.0 CULTURAL CONTEXT

Virginia's Native American prehistory typically is divided into three main periods, Paleoindian, Archaic, and Woodland and based on changes in material culture and settlement systems. In recent decades, the possibility of human presence in the region that pre-dates the Paleoindian period has moved from remote to probable. For this reason, a Pre-Clovis discussion precedes the traditional tripartite division of Virginia's Native American history. The seventeenth-through twentieth-century historical overview follows the VDHR (2017) guidelines. The cultural context, as defined by the Secretary of the Interior's *Standards and Guidelines for Archeology* and Chapter 3 of the VDHR's (2017) guidelines, provides the historic, social, and environmental information required for evaluation of any cultural resources present within the project area.

3.1 PRE-CLOVIS (?–15000 BC)

The 1927 discovery of a fluted point in the ribs of an extinct species of bison at Folsom, New Mexico proved that ancient North Americans had immigrated during the Pleistocene. It did not, however, establish the precise timing of the arrival of humans in the Americas, nor did it adequately resolve questions about the lifestyle of those societies (Meltzer 1988:2-3). Both the stratigraphic record and the radiocarbon assays from several sites, including the Cactus Hill site in Sussex County, Virginia, suggest the possibility of human occupation of North America before the fluted-point makers appeared on the scene (McAvoy and McAvoy 1997). Buried strata at the Cactus Hill Site have returned radiocarbon dates of 15,000 years ago from strata situated below levels containing fluted points (McAvoy and McAvoy 1997:165). To date only a handful of pre-Clovis sites have been identified in North America, including in Pennsylvania, Virginia, and New Mexico. The likelihood of identifying pre-Clovis sites within the project area is extremely low.

3.2 PALEOINDIAN PERIOD (PRIOR TO 8000 BP)

Most large Paleoindian sites in the southeastern United States are quarry or quarry-related (Meltzer 1988:21), though multiple band aggregation sites also occur (McAvoy 1992:145). Recognizable sites most often result from long-term habitation or repeated use of the same location. It follows from the presence of primarily quarry or quarry-related sites that stone outcrops were regularly revisited. For example, the Thunderbird Site in the Shenandoah Valley (Gardner 1974, 1976) and the Williamson Site in south-central Virginia (McCary 1951, 1975, 1983) rank among the most important Paleoindian sites in Virginia, and in the eastern United States as a whole. Both sites are large camps associated with local sources of high-grade cryptocrystalline lithic materials (Gardner 1981, 1989).

Though the full range of available lithic resources was used to manufacture fluted points (e.g., Phelps 1983), a number of studies have noted a focus on cryptocrystalline materials (e.g., chert, jasper, chalcedony; Gardner 1974, 1989; Goodyear 1979). The recovery of cryptocrystalline materials at locations far removed from quarries indicates that exchange, extensive group movement, or both,

characterized the Paleoindian era. In addition, the very limited differences between sites and within sites suggest that most people had access to all available resources, while the small size of most Paleoindian sites indicates group size generally was limited to extended families.

In concert, the evidence suggests wide-ranging mobility and a social order involving low-level inter- and intra-group exchange and limited, if any, status differences between and within groups. Ethnographers have grouped such societies under the rubric of the "foraging mode of production." Such societies, notably the San of the Kalahari, are fiercely egalitarian, resisting attempts to garner individual power through a combination of ridicule, sharing, and a fission-fusion pattern of settlement. If all else fails, egalitarian hunter-gatherers "vote with their feet," moving away from the offending individuals (Lee 1979). The combination of high mobility, the absence of domesticated crops, and an egalitarian ideology precludes construction of elaborate housing, extensive storage facilities, and accumulation of non-portable goods.

3.3 ARCHAIC PERIOD (8000–1200 BC)

The Archaic began with the northward retreat of periglacial environments and the appearance of archaeological assemblages lacking fluted points. In the Chesapeake Bay region, a shift from moist, cool conditions to a warmer, drier climate accompanied the glacial retreat. In response to changing climatic conditions, in particular the receding ice sheets, Chesapeake Bay sea levels rose continuously from roughly 15,000 years ago to the present. Simultaneously, local subsidence of the earth's crust also may have contributed to the formation of the Chesapeake Bay. Between 15,000 and 14,000 years ago, the waters of the Atlantic began to submerge portions of the continental shelf. For every 30 centimeters (approximately 1 foot) of sea level rise, approximately 1,673 feet of the shelf were inundated. Ten thousand years ago the sea began to flood the mouth of the ancestral Susquehanna River, located near the present-day mouth of the Chesapeake Bay. Sea level rose at approximately 0.1 inch per year between 8000 and 3000 years ago. At 8000 years ago, the head of the ancestral bay was near Smith Island, at 5000, near Annapolis, and by 3000 years ago, it had reached the Sassafras River. Numerous archaeologists suggest that the stabilization of water levels in the bay at this time provided the necessary conditions for the development of extensive shellfish beds and habitats favorable for anadromous fish (e.g., Waselkov 1982). After approximately 1000 BC, sea level rise slowed to approximately 0.12 centimeters/year, and Chesapeake Bay approached its present contours (Dent 1995:69-95).

In addition, in contrast with the broad similarity among Paleoindian point forms, distinct style zones developed during the Early and Middle Archaic (8000–3500 BC). The Atlantic Coast/Southeastern stylistic sequence was not characteristic of the Midwest (Ford 1974:392). Increased use of locally-available lithics also occurred between 8000 and 3500 BC (Custer 1990:36; Sassaman et al. 1988:85-88). The reduction of the size of style zones and the focus on local lithic materials implies contracting social networks and incipient territories, possibly a reaction to population growth (Anderson and Hanson 1988:271). Despite changes in patterns of mobility and point form, numerous archaeologists argue on environmental (Custer 1990:2-8) and subsistence (Smith 1986) grounds for continuity in social dynamics between 10,000 and 6,000 BC. From this point of view, Dalton through Lecroy populations exhibited "general similarities and regional habitat-related variation in settlement-subsistence patterns and material culture assemblages"

(Smith 1986:10). Band-level social organization involving seasonal movements corresponding to the seasonal availability of resources and, in some instances, shorter-interval movement characterized Archaic societies.

Reliance on ground-stone technology increased during the Archaic period. New tool categories associated with the Archaic include celts, net sinkers, pestles, pecked stones, and axes Archaic knappers also produced chipped-stone versions of celts and axes and, near the end of the Late Archaic, labor-intensive vessels carved from soapstone quarried in the Piedmont formed an important part of assemblages (Geier 1990; McLearen 1991).

3.3.1 Early Archaic (8000–6500 BC)

Corner- and side-notched points with serrated blades predominate at the beginning of the Early Archaic period, reflecting innovation in hafting technology and, possibly, the invention of the atlatl. Notched point forms include Palmer and Kirk Corner-Notched and, in localized areas, various side-notched types. Around 7000 BC, a variety of bifurcate base projectile point forms appeared in the Middle Atlantic region. In eastern Virginia, LeCroy points constitute the majority of bifurcate forms (Dent 1995; Justice 1995). Despite the shift in point form over time some researchers portray the Early Archaic as a continuation of the Paleoindian period, characterized by reliance on cryptocrystalline lithic material and similar settlement and subsistence patterns (Gardner 1989). Early Archaic sites are still locally uncommon at this time, and it is during the Middle Archaic period that a proliferation of sites occurs in the Piedmont (Gardner 1982, 1986).

3.3.2 Middle Archaic (6500–3000 BC)

The appearance of stemmed projectile points and a shift towards more expedient use of stone marks the beginning of the Middle Archaic across much of the Atlantic Slope and Southeast (Amick and Carr 1996:43-45; Justice 1995). In this area of Virginia, the most common Middle Archaic projectile point types are (from oldest to most recent) LeCroy, Stanly, Morrow Mountain, and Guilford, followed by the side-notched Halifax type sometime after 3500 BC. This latter type is generally one of the most abundant found in upland interior settings; however, it is possible that many riverine sites of the period are hidden under alluvial sediment. Informal modified flakes to some extent replaced formal unifacial tools, and local materials constitute a greater percentage of Middle Archaic assemblages than had been true of earlier time periods. Sites occur throughout the landscape, including beneath the now-inundated Chesapeake Bay (Blanton 1996; Dent 1995:173-178).

3.3.3 Late Archaic (2500–1200 BC)

Stemmed and notched knife and spear point forms, including various large, broad-bladed stemmed knives and projectile points (e.g., Savannah River, Susquehanna, Perkiomen points), rank among the most distinctive and securely dated Late Archaic point forms (Coe 1964; Dent 1995; Justice 1995; Ritchie 1971). Marked increases in population, and, in some areas, decreased mobility appears to characterize the Late Archaic throughout eastern North America. Locally, there is an increase in the numbers of late

Middle Archaic (Halifax) and Late Archaic (Savannah River) sites over those of earlier periods, suggesting a population increase and/or intensity of use of this area of central Virginia between about 3500 B.C. and ca. 1200 B.

Soapstone bowls are a well-known feature of Late Archaic exchange systems (McLearen 1991:107-8). In addition, Stewart (1989:52) argues for broad-based exchange of "artifacts made from jasper, argillite, rhyolite, ironstone, soapstone, Midwestern lithics, obsidian, marine shell and copper" throughout the Middle Atlantic region during the Late Archaic. Thus, Late Archaic society clearly differed from that of earlier times. The production and wide-spread exchange of utilitarian and ritually important, labor-intensive goods does not fit the expected archaeological signature of highly egalitarian foragers. Rather, a social order exhibiting some sort of status differences among individuals or groups (Mouer 1991a:265) and somewhat restricted group movement (Stewart 1989:57) likely existed. Still, sites dating to the Late Archaic occur frequently throughout Virginia and the Middle Atlantic region. Late Archaic sites occur in greater numbers and in a wider range of environments than sites associated with the Early and Middle Archaic periods (Klein and Klatka 1991).

3.4 WOODLAND PERIOD (1200 BC–AD 1600)

The onset of the Woodland period traditionally correlates with the appearance of ceramics (Willey and Phillips 1958:118). Early theorists linked ceramics with agriculture, though few continue to support this position (cf. reviews in Egloff 1991; Hodges 1991). Rather, the evolution of subsistence and technological systems (e.g., Gardner 1982) and various aspects of pan-Eastern interaction (e.g., Egloff 1991; Klein 1997) currently are believed to underlie the evolution of ceramic containers.

3.4.1 Early Woodland (1200–500 BC)

The steatite-tempered Marcey Creek type and variants containing other mineral inclusions appear to date between 1200 and 800 BC (Egloff 1991:244-5). Manson (1947) unearthed flat bottomed, plain sherds and cord-marked sherds with conoidal bases, both of which included soapstone-temper, in the uppermost of two distinct strata at the Marcey Creek Site. The lowermost level contained narrow variants of Savannah River points, termed Holmes Points by Gardner (1986), and soapstone bowls, suggesting that soapstone-tempered sherds post-date bowls of soapstone (but see Sassaman 1999). Earlier Slattery (1946) had identified similar sherds at a site on Seldon Island, along the Potomac River to the northeast of Leesburg, along with sand-and-grit tempered sherds. Though friable sand-and-grit-tempered Accokeek Creek and Elk Island ceramics appear subsequent to Marcey Creek, associated C-14 on stratified sites, dates range from 1100 through 500 BC. Klein and Stevens (1994) cite regional data to support the proposition that, while the thickness, amount of temper, and size of temper in quartz/sand tempered, cord-marked ceramics shifted over time, similar pots continued in use into Middle Woodland times.

Small bifaces and expedient tools such as drills, perforators, scrapers and utilized flakes regularly appear in Early Woodland assemblages. Other lithic artifacts reported on Early Woodland sites in the Chesapeake region include bipolar flakes, hammerstones, net sinkers, mortars, and pestles (McLearen 1991). Also noted on sites in the region are tools of bone, and projectile points manufactured from antler,

bone, turkey spurs, and shark's teeth (Waselkov 1982). The increased number of sites dating to the Early Woodland, coupled with the recognition of structures, features, and activity areas at some sites, suggests rising population size in the Chesapeake region (e.g., Mouer 1991b:38-9; Stewart 1995:183). In contrast, noting that the addition of pottery to stone adds temporally diagnostic artifacts to the archaeological record, Fiedel (2001:106–7) observes that more sites are expected to appear in the archaeological record during Woodland times. Furthermore, the various Broadspears, dating to the Terminal Archaic (ca. 2000–1000 BC), may represent a curated technology (Barber and Tolley 1984), while replication experiments suggest stemmed bifaces similar to Early Woodland types rank among the easiest forms to produce using quartz (Bourdeau 1981). Therefore, a shift from a curated, less commonly discarded biface form, to points easily produced from a ubiquitous material accompanied the appearance of ceramics. Thus, the absence of a dramatic swell in the number of sites, coupled with decreased representation of diagnostic point forms, indicates a demographic trough or at best a flat demographic curve characterized the period.

3.4.2 Middle Woodland (500 BC–AD 900)

Popes Creek net-impressed ceramics appear after roughly 500 BC, marking the beginning of the Middle Woodland I period (500 BC−AD 200) (Blanton 1992:72-3; Egloff and Potter 1982:99). Cord-marked ceramics and stemmed points, however, continued in use for some time after AD 500. Net-impressed surface treatments occur on a variety of ceramic types manufactured during Middle Woodland times. Pope's Creek ceramics first appear after 500 BC, with the start of the Middle Woodland (Blanton 1992:72-3; Egloff and Potter 1982:99). Early Woodland cord-marked ceramics and stemmed projectile points are found in Middle Woodland contexts, suggesting a continuation of Early Woodland technologies (McLearen 1992:44-5). The Prince George and Varina types appear to represent a continuum of development in the technology used to produced Popes Creek sherds, rather than dramatically different types (Mouer et al. 1986). After AD 200, shell-tempered, net-impressed, cord-marked, and plain pottery classified as the Mockley type becomes predominant in the outer Coastal Plain of Virginia and Maryland, though generally similar sherds tempered with grit continued in production as well (Johnson 2001:100).

The appearance of assemblages containing significant amounts of durable ceramics after 500 BC indicates a shift in the organization of production occurred during the Middle Woodland periods (Brown 1986, 1989). In addition to the advantages of ceramic vessels as cooking pots, ceramic production contrasts with the manufacture of baskets and wooden bowls in its embrace of economies of scale. Rather than a start-and-stop process that fits well into odd bits of time, ceramic production required greater scheduling and continued attention over an extended period of time. Shifts in the scheduling of work, therefore, accompanied the transition from Early to Middle Woodland times.

Broad-spectrum hunting-fishing-gathering continued to characterize the region as a whole throughout the Middle Woodland period. Shellfish, anadromous and resident fishes, deer, waterfowl, and turkey ranked high among the important fauna in the Middle Woodland diet. Various nuts, amaranth, and chenopod seeds also appear to be important resources during this period. After 300 BC, large shell middens containing dense concentrations of artifacts become increasingly common, indicating repeated use of at least one type of site. Middens and the presence of houses at a number of sites indicate longer stays, though populations remained far from sedentary (Gallivan 2003). People continued to reside for much of

the year in relatively small settlements, and interior storage features rarely occur on Middle Woodland sites (Gallivan 2003:75-98).

3.4.3 Late Woodland (AD 900–1600)

Intensified use of cultivated plants, particularly maize, beans, and squash, distinguished the Late Woodland adaptation from that of earlier periods. European accounts describe a heavy reliance on slash-and-burn agricultural methods. In addition to cultigens and shellfish, Late Woodland peoples throughout the region continued to rely on various mammals, fish, and birds for sustenance (Dent 1995:251). Perhaps as a consequence of the greater importance of cultigens in the diet, access to expanses of arable land ranks among the most important factors influencing site selection (Dent 1995; Potter 1993).

Drawings and journals of early European explorers describing Indian villages indicate that houses were constructed of oval, rectanguloid, or circular frames of flexible green sapling poles set in the ground, lashed together, and covered with thatch or bark mats. The historical accounts are consistent with data obtained from archaeological excavations of Late Woodland village sites (Potter 1993:24-27). Similar, though smaller, structures characterize single family camps (Klein et al. 1998). Temporal and spatial variation in the size of structures, however, resulted from differences in status as well as site function. Exchange, of shell and copper in particular, expanded after AD 1500, while historical documents indicate that more complex chiefdoms existed during the 1500s in Coastal Virginia (Klein and Sanford 2004).

Late Woodland populations constructed palisaded villages. In addition, Native American settlements included nucleated villages lacking palisades, dispersed hamlets, and temporary camps. Work by Potter (1993), Hodges and Hodges (1994), and Mouer et al. (1992) suggest that dispersed villages were common throughout Virginia. Housing varied throughout this region: some sites show evidence of longhouses located adjacent to the palisade, while elsewhere, short, oval structures have been unearthed (Dent 1995; Gallivan 2003; Hodges and Hodges 1994; Mouer et al. 1992; Potter 1993; Stephenson 1963).

The large base camps, hamlets, and villages are typically located on bluffs, terraces or high floodplains adjacent to rivers or major tributaries. Small seasonal camps and non-seasonally based satellite camps supporting nearby sedentary villages and hamlets are located along smaller streams in the interior. Limited concentrations and sparse scatters of lithics and ceramics typically characterized these campsites. The majority of the Late Woodland sites that had been recorded at the time of the Barber et al. (1992) study were located along the major high order streams and rivers, consistent with the ethnohistoric evidence (e.g., Rountree, Clark, and Mountford 2007). By the end of the Late Woodland Period, Dent (1995) notes that a generally unoccupied buffer zone appears to have been maintained between the Powhatan on the inner Coastal Plain and the Monacan west of the fall line. According to Dent, this, and other similar buffer zones throughout the Chesapeake region, may have been game preserves or just "...the result the tendency of chiefdoms to nucleate populations for the purposes of control."

3.5 SETTLEMENT TO SOCIETY (1600–1750)

Europeans increasingly affected the North American landscape after AD 1500. British, French, and Spanish expeditions visited the Chesapeake Bay and its tributary rivers beginning in the mid- to late sixteenth century (Quinn 1977). Pedro Menendez de Aviles, first governor of Spanish *La Florida* "was determined to find out all he could about the [putative] passage to the Pacific from the Indians who lived near the Chesapeake Bay" (Gradie 1993:155-7). Captain Vincente Gonzalez and Juan Menendez Marques likely visited the Chesapeake Bay in 1588. These Spaniards, searching for Sir Walter Raleigh's colonists, "sailed along the western shore of the Chesapeake Bay to its head and then traced the western coast of the Eastern Shore" and most likely encountered the region's inhabitants (Lewis and Loomie 1953:186-202).

In the late sixteenth century (ca. 1570), a Spanish Jesuit mission was established, most likely along the York River's southern bank. It failed, having met a violent fate at the hands of local Indians. Most explanations focus on the personal motivations of an Algonquin seized as a youth and known to the Spaniards as Don Luis. While not dismissing personal motivations, Mallios (2004) suggests that hostilities at Ajacan, as the Spanish mission was known, followed a more general pattern that also led to conflict at Roanoke and Jamestown. The groups frequently continued to interact and exchange commodities, but further economic transgressions worsened relations and led to hostility" (Mallios 2004:147).

Sustained contact between Native Americans and Europeans began with the construction of the English fort at Jamestown in 1607. The continued growth of European population, which led to the Anglo-Indian wars of 1609−1644 in Virginia, destroyed the Chesapeake world observed by John Smith (Potter 1993:179-98). Likewise, the seemingly inevitable conflict over land, the very different, yet critical, importance of trade in English and Algonquian culture, and the difficulty of apprehending the other through cultural blinders undermined the harmony some Colonists had envisioned. Equally important, proximity to European traders perhaps threatened some aspects of pre-Columbian society. The English land-grab heightened tensions within some villages by destroying the Algonquian subsistence base and substituting contracts for reciprocity (Rountree 1989).

John Smith's query about the "worlds he did know" elicited a description of the cultural landscape from a captive Mannahoac. The Mannahoac, Amorolek, "replied he knew no more but that which was under the sky that covered him, which were the Powhatans, with the Monacans and Massawomeks higher up in the mountains. Then we asked him what was beyond the mountains; he answered the sun, but of anything else he knew nothing because the woods were not burnt" (Haile 1998:272). While perhaps an inaccurate representation of Amorolek's geographic knowledge, the encounter represents the only documented reference to northwestern Virginia in the Jamestown Narratives. Though his map appears generally accurate as far upstream as the present location of Harpers Ferry, the map lacks detail and Smith depicted no settlements in the area of present-day Loudoun County (Figure 3). English exploration of the interior began during the seventeenth century, but the expansion of English settlement beyond the falls of the River was an eighteenth-century phenomenon.

Figure 3. Detail of *Virginia Discouvered and Discribed [sic]* Depicting the Project Area Vicinity (Smith and Hole 1624; Library of Congress Geography and Map Division).

Early settlement of Virginia spread first along the coastal region and up major rivers. The pace of county formation provides one index of the expansion of European society beyond the Tidewater. Northumberland County, formed in 1648, originally encompassed the Rappahannock and the Potomac Valleys to indeterminate northern and western boundaries. Political subdivisions followed fluvial boundaries, as the Potomac counties of Westmoreland (1653) and Stafford (1664) and the Rappahannock counties of Rappahannock (1656 and after 1692, Richmond) and King George (1721) were created.

Demand for a new county increased as the population of Stafford spread, and hardship for the new residents escalated after 1722 due to the distance from the Stafford County courthouse, resulting in a bill dividing Stafford County into two parts. After the first bill failed in 1726, a second bill, which passed on July 9, 1730, formed Prince William County.

The act specified no northern or western limits for the county; therefore, its original territory included the current areas of Fairfax, Arlington, Alexandria, Loudoun, and Fauquier counties, and, in some interpretations, the entire Rappahannock and Shenandoah River Valleys (Figure 4). In 1742, Fairfax County was carved from Prince William, and by 1757, two years before the American phase of the conflict between England and France ended, population growth in the northern Piedmont led to the creation of Loudoun County from Fairfax County. Loudoun took its name from John Campbell, the 4th Earl of Loudoun, a commander of British Forces in the Colonies from 1756 to 1759.

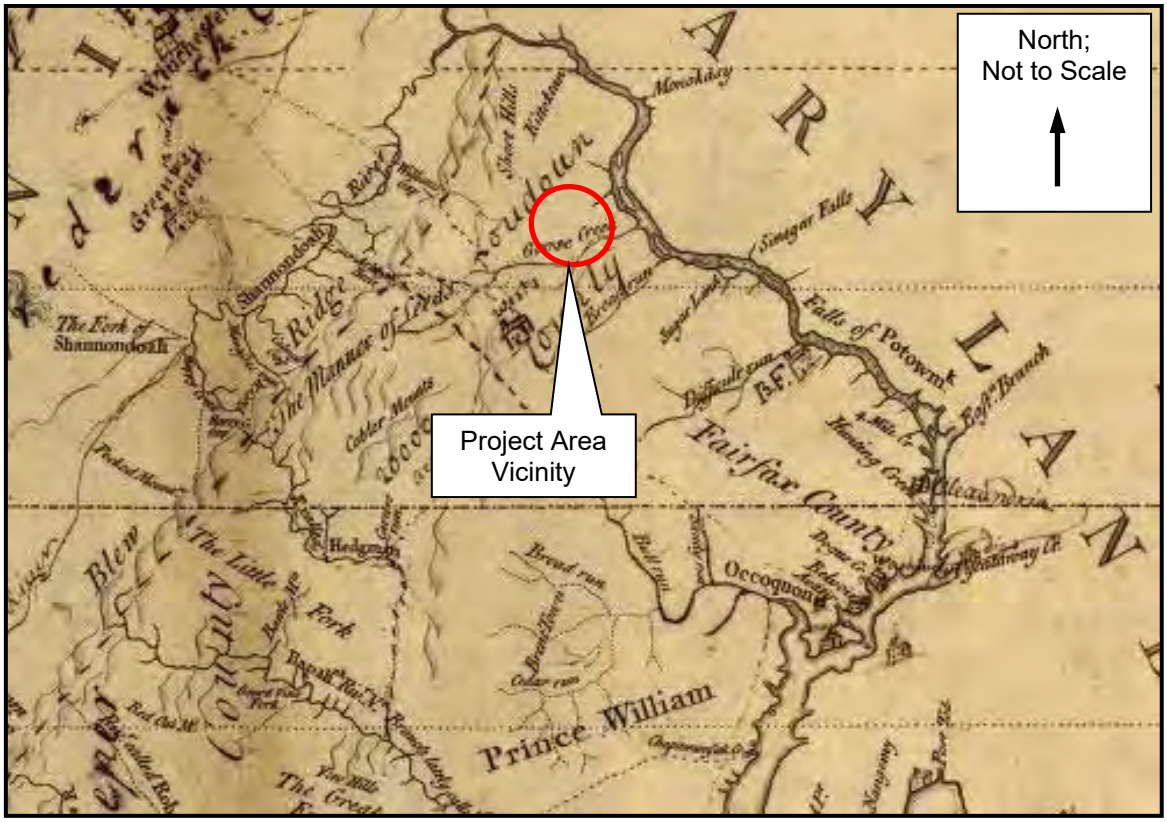


Figure 4. Detail of *A survey of the northern neck of Virginia, being the lands belonging to the Rt. Honourable Thomas Lord Fairfax … as surveyed according to order in the years 1736 & 1737* Depicting the Project Area Vicinity (Warner 1747; Library of Congress Geography and Map Division).

The different geographic regions of Loudoun County were settled by diverse groups of immigrants, leading to differences in the county's development. The southeastern portion of the county, extending from the Potomac River southward to Middleburg and from Catoctin and Bull Run Mountains eastward to the eastern border of the county was settled and developed by "fine old English Cavalier stock" (Head 1908). The northwest portion of the county was settled by German immigrants, mostly from Pennsylvania (Head 1908).

The immigrants established distinct communities in Loudoun between 1725 and 1750. English settlers introduced slavery, which became an important part of the labor force on the large farms and plantations established in the eastern and southern sections of the county. In contrast, German, Quaker, and Scotch-Irish settlers in the northern and western portions of Loudoun either spurned slavery or had meager slave holdings. This difference would lead to a dichotomy within the county and would divide loyalties during the Civil War (Poland 1976).

3.6 COLONY TO NATION (1751–1789)

In part, the soil-depleting nature of tobacco production fueled the geographic expansion of the English colony (Kulikoff 1986:46-8). Though tobacco continued in importance in Virginia throughout the ante-bellum era (McPherson 1988:101), the post-1750 stagnation in salaries and export records indicate a decline in the importance of tobacco after the middle of the eighteenth century. Wheat and corn began to replace tobacco as a staple as Loudoun County was settled (Seiner 1985:410-12). Between 1740 and 1764 "prices for tobacco on the world market rose far less than for wheat and flour because the traditional grain suppliers, Poland and Britain, were unable to meet the sharply increasing demands for foodstuffs in the West Indies and southern Europe" (Seiner 1985:412). In addition, grain sales afforded planters a degree of control over exchange rates (Seiner 1985:414-15). The farmers in the Virginia Piedmont turned first to corn, then to wheat as preeminent cash crops (Keller 2000:21; Seiner 1985:412-13).

The French and Indian War initially spurred wheat production in the northern Piedmont and Shenandoah Valley, as farmers sought profits by feeding troops garrisoned along the frontier. Demand for wheat during the American Revolution further stimulated grain production. By the 1780s, the northern Virginia Piedmont was among “the most important southern wheat growing regions” and, after the cessation of hostilities, wheat was the region’s preeminent market crop (Keller 2000:21). In contrast to the continuity in farming practices, the Revolution altered civil society.

In 1756, the year before Loudoun County was created, the total population of Fairfax County was 7,628 persons, 3345 (44.0 percent) of whom lived north and west of Difficult Run. The majority of the area’s citizens lived close to the Potomac (Netherton et al. 1991:32-33, Fesler and McCartney 1993:13). The initial creation of the community of Leesburg began with the establishment of a tavern by Nicolas Minor in 1755 at the intersection of Old Carolina Road (Route 15) and Potomac Ridge Road. Officially established in 1758 on the original 60 acres laid out by Minor in a traditional six crossing streets pattern, the town of Leesburg was originally created as an outfitting post during the French and Indian War. The British used the town of Leesburg as a staging ground for military action throughout the western frontier. Although the original name was "George Town" in honor of King George II, the town was renamed in honor of the influential Lee family, specifically Virginia Governor Thomas Lee, when Leesburg became the County seat (Scheel 2002).

The closest town to the project area, today known as Hamilton, first saw permanent settlement in 1768, when George and Tabitha Tavenner built a house within the boundaries of the current town. Their son Richard subsequently build a house of logs and stone, which he named Harmony. The settlement took the name of Harmony as well, which it held until 1835 (Town of Hamilton, Virginia 2001).

During the American Revolution, Loudoun County provided a substantial supply of both men and arms to the war effort. In general, Loudoun’s reaction to British colonial policy was something of a microcosm of American reaction in general. In June 1774, Loudoun’s citizens met at the courthouse in Leesburg where they denounced the Intolerable Acts, the Tea Act and the Admiralty Courts. Loudoun formed its own maintenance Committee of Safety in 1774 and after a May 1775 meeting, Loudoun considered itself to be

at war with England. Between 1780 and 1781, Loudoun had the largest militia of any county in Virginia, with 1746 men (Poland 1976).

3.7 EARLY NATIONAL PERIOD (1790–1829)

The American Revolution, along with the ensuing economic, social, and political consequences, threatened the interlocking class, racial, and gender relations established during the early eighteenth century (Kulikoff 1986:312-3, 421). The Revolution severed ties to both the British monarch and the Anglican Church. The growing number of Baptists, Methodists, Presbyterians, and Deists added to political disruption. By granting spiritual equality to all, and occasionally arguing for legal equality, members of these sects added to the threat raised by British promises of emancipation and the language of the Declaration of Independence (Kulikoff 1986:417-420, 423-4). In 1806, largely in response to rising numbers of free blacks, the Assembly passed legislation forbidding free blacks from remaining in the state more than one year after manumission. This law was not rigorously enforced (Schwarz 1987:321-2).

In the years after the American Revolution, Loudoun County was dominated by farmers with relatively modest landholdings, who raised grain crops and livestock for export with the labor of a moderate number of slaves. Up to three quarters of landowners during this period held between 100 and 500 acres, while only 11 individuals claimed tracts of more than 1,000 acres. In fact, the period 1790 through 1820 in Loudoun County has been described as one of “demographic stability and agricultural reform” (Poland 1976). The population of Loudoun County was 18,777 in 1790 (Porter 1960).

The town of Leesburg played an important role in the early republic. Due to the threat to Washington during the War of 1812, the town of Leesburg acted as the temporary capitol of the United States and many documents (including the Constitution and the Declaration of Independence) were moved to Leesburg from the Federal Archives. In addition, the Monroe Doctrine was drafted at Oak Hill just south of Leesburg, the estate of President James Monroe.

Other than these few national concerns, the development of Leesburg followed the agricultural development of the rest of Loudoun County. Despite the obvious benefits of the transition from tobacco to grain crops, the farming methods of the late eighteenth and early nineteenth centuries continued to have a deleterious effect on exhausted soils. Recognizing the need for improved agricultural practices, Loudoun County farmer John A. Binns spearheaded the agricultural reform movement in Virginia. His 1803 *Treatise on Practical Farming*, which won the admiration of President Thomas Jefferson, outlined a formula for improving crop yields that would come to be known as the “Loudoun System.” In his widely read book, Binns recommended deep plowing, the use of gypsum to restore soil productivity, and revising the old crop rotation pattern to include a third year of clover (Poland 1976). Binns’ reforms were widely adopted throughout Virginia in the early years of the nineteenth century, with admirable results. By 1818, local farmer Robert Russell noted that most of his Loudoun County neighbors had abandoned shallow plowing and adopted the new farming practices.

Binns himself commented on the markedly improved crop yields: “I do not think that the millers in the compass of ten miles, in the settlement where I live will be able to manufacture much above one half; there are some in the settlement that will be obliged to desist from threshing, being unable to find room in the mills, or yet deposit any more in their granaries” (Poland 1976). Binns’ self-promotion notwithstanding, it was clear that the general acceptance of agricultural reforms had a beneficial effect on Loudoun County farming in the first decades of the nineteenth century; however, bumper crops were of little value if they could not be transported to market.

At the repeated urging of Alexandria merchants, the Little River Turnpike was organized in 1802 to provide a reliable, economical route between the “breadbasket” of Loudoun County and the Potomac River port. Opened to traffic by 1806, the turnpike was one of the first and most successful of Virginia’s toll roads, offering farmers a paved road for a distance of 34 miles, from Aldie to Alexandria. The Little River Turnpike ultimately would become modern Route 50. By the early 1850s, the Leesburg & Aldie Turnpike Company had established a north-south route linking the important milling town of Aldie with Leesburg and the Little River Turnpike. Situated near the intersection of these two important transportation routes, the farmers living near this area would have been able to send their grain crops to be milled, and then to market, with relative ease (Poland 1976).

The surviving tithables lists from Loudoun County for the period 1759 to 1762 indicates that about 8 percent of the white adult population owned slaves when the county was formed in 1757. Loudoun County’s enslaved population remained relatively modest in the first quarter of the nineteenth century, fluctuating from 29 percent in 1790 to 40 percent in 1820. More than 60 percent of slave owners claimed fewer than five slaves, and most farmed between 100 and 500 acres. Out of the roughly 600 households in the county that same year, only 30-35 consisted of slave plantation “quarters” owned by absentee gentry. Moreover, only 11 individuals owned tracts of more than 1,000 acres in Loudoun County (Poland 1976). The larger plantations where most bondsmen labored, like Philip Ludwell Lee’s estate near the mouth of Goose Creek, bounded the Potomac River or occupied the more developed eastern half of the Loudoun County (Phillips 1997:259, 378, 388-89).

Historical maps made during the early nineteenth century illustrate the improved transportation routes. In 1807, when Bishop James Madison prepared a map of Virginia, he indicated that the county’s main east-west transportation corridors were configured much as they had been during the second and third quarters of the eighteenth century, but he also showed that several major public roads emanated from Leesburg, the Loudoun County seat (Figure 5). Herman Böyë’s 1828 map of the project area (not shown) illustrates roads, mills, and natural resources surrounding Leesburg during the 1820s. Böyë noted that new roads had been built and by 1827 two stagecoaches a week were running between Alexandria and the Orange County courthouse (Netherton et al. 1991:28; Fesler and McCartney 1993:13).

Figure 5. Detail of *A Map of Virginia formed from actual surveys, and the latest as well as most accurate observations*, Depicting the Project Area Vicinity (Madison 1807; Lionel Pincus and Princess Firyal Map Division, The New York Public Library)

3.8 ANTEBELLUM PERIOD (1830–1860)

In general, the post-Revolution, antebellum economic system of northwestern Virginia resembled that of the mid-Atlantic region, rather than the lower South. Nevertheless, the "peculiar institution," differentiated Virginia from points north. Wealthy Virginians renewed their commitment to slavery. Other Anglo-Americans, however, became less likely to own slaves than during the earlier years of the Republic. An agricultural and economic depression characterized much of this era, at least until the 1840s and '50s. Wheat prices declined sharply. In addition, the completion of the Erie Canal opened the market to mid-western grains. Though agitation for the construction of canals had begun at the end of the previous century, it was not until 1833 that the Chesapeake and Ohio Canal opened from Harpers Ferry to Georgetown (Keller 2000:24).

In 1831, the area known as Harmony saw increased trade and growth courtesy of a road running between Leesburg and Snickersville (present-day Bluemont), which the Leesburg and Snickers Gap Turnpike Company opened. Harmony had enough residents by 1833 to support the construction of the town's first church, the Harmony Methodist Church. By this time, Harmony also was referred to as Hamilton Store, due to a general store run by Charles Bennet Hamilton; in 1835, John Quincy Adams approved a request for a post office within the store and the town's name was recorded as Hamilton – a name which it bears to this day (Town of Hamilton, Virginia 2001).

In order to compete with and for western commerce, the State borrowed heavily to invest in railroad and road construction between 1840 and 1860 (Willis 1986:425). In general, farm economies prospered during the 1850s as wheat prices rose. This period also witnessed the introduction and general use of animal-powered agricultural machinery (Parker 1986:90).

3.9 CIVIL WAR (1861–1865)

Robert E. Lee condemned secession as “revolution.” Most Virginians agreed with the majority of the United States, feeling the Constitution provided adequate protections to the institution of slavery, and secession was not necessary. But reliable news sources did not exist. Four days after the attack on the U.S. in Charleston, staged to draw Virginia into the war, the Virginia Convention was on the verge of adjourning – and ending all discussion of joining Jefferson Davis. Without authority, ex-Governor Henry Wise convinced militiamen to attack the U.S. Arsenal at Harper’s Ferry, as well as the Gosport Navy Yard. Wise took the Secession Convention into secret session and told them their “patriotic sons” were fighting and dying and that they needed them to vote for secession. Having lost three times, his fabrication about Harper’s Ferry and Gosport squeaked out a majority of 88 to 55. Exploiting the lack of reliable news, Virginians found themselves propelled into a war against the United States. Loudoun lay at the very edge of Confederate control – its neighbors just across the river to the north and west refused to follow Wise. One third of Virginia and Virginians seceded from the secessionists and became the loyal State of West Virginia (Freehling 2008; Scheel 2002).

Situated only 25 miles west of Washington, D.C., the county remained a hotly contested area throughout the war, with both Federal and Confederate forces tramping the landscape on scouting and reconnaissance missions. Geographically, Loudoun invited military movement, since numerous fords crossed the Potomac River; the county’s ample food stores attracted continual “hay-soldiering” (foraging for horses) and “pie-rooting” (feeding hungry soldiers) (Poland 1976). Upwards of 50 military engagements of varying magnitude were fought in Loudoun County during the course of the war. The town of Leesburg was a focus of military activity throughout the war. Forts Evans, Beauregard, and Johnston were constructed by the Confederacy surrounding the heights of Leesburg in the early stages of the war.

The Harmony Skirmish took place near the project area and the nearby town of Hamilton. On March 21, 1865, Confederate Colonel John S. Mosby and his men, referred to as Mosby’s Rangers, ambushed a group of Union soldiers under Colonel Marcus Reno. The soldiers had been sent to Loudoun County in search of Confederate combatants. The Skirmish marked the last major Civil War event in Loudoun County and provided little overall tactical gain for either side. The Union soldiers suffered light casualties but forced Mosby’s Rangers to withdraw due to their superior equipment and larger number of soldiers. The wounded Union combatants received care from the residents of Hamilton (Town of Hamilton, Virginia 2001).

3.10 RECONSTRUCTION AND GROWTH (1866–1916)

Loudoun County faced a difficult period of rebuilding after four long years of war. Striking at Mosby's partisans, Union forces had damaged or destroyed buildings, burned crops, and dispersed livestock. Both sides had helped themselves to the county's ample agricultural resources, and continual military activity had effectively disrupted everyday life. Businesses were shut down, farms left poorly attended, and local government services suspended. The emancipation of the county's slaves proved financially damaging for many local landowners, and land prices dropped considerably in the immediate postwar period.

Few mills were left in operating condition at the end of the Civil War; those that were operable quickly reestablished themselves in the production of corn and wheat, and the associated saw mills supplied the needed lumber to rebuild the countryside. Other businesses that closed at the beginning of the war had the added hardship of rebuilding their businesses in a decimated economy. The most destruction could be seen in the rural areas of Loudoun County, where outbuildings were destroyed, crops were confiscated, and livestock was either taken or run off the properties. These rural farmers may have had their houses left mostly intact, but they had to rebuild everything else on their farms, and with little money to invest in reconstruction most farmers cultivated smaller portions of their farms.

Rebuilding communities was easier in western Loudoun County, where the influence of abolitionist Quakers and Germans led to community compliance with the federal occupation force. Reconciliation was codified within articles and editorials in the counties' major newspapers, including the Democratic Mirror in Leesburg and the True Index in Warrenton. In the initial postwar issue of the Democratic Mirror on May 31, Editor Benjamin Sheetz wrote of "a very pretty flag emblazoned with the stars and stripes throwed to the breeze" atop the Loudoun County courthouse (Scheel 2003). By 1870, agricultural production had surpassed antebellum levels, and the county was well on its way to economic recovery (Poland 1976). Population growth near the site of the present-day project area led to incorporation of Hamilton in 1875, after which point it was officially known as the Town of Hamilton (Town of Hamilton, Virginia 2001).

By 1880, Loudoun County was a primary agricultural region of Virginia, as grains, corn, wheat, and even fruit became major cash crops by the early twentieth century. Livestock farms also increased the overall agricultural industry of the county, raising cattle, horses, pigs, and sheep. This led to new laws requiring stone or wood fences to keep livestock in their designated pastures. As an outgrowth of the increased livestock, the dairy industry began in the 1870s, primarily in the eastern part of the county (Head 1908, Poland 1976).

The reopening of the rail lines to Loudoun County made the region more accessible and many small communities sprung along the rail lines. By 1871, the Alexandria, Loudoun, and Hampshire Railroad completed repairs and continued to expand its service to Hamilton. Service to Round Hill was completed by 1874 and to Bluemont by 1900. The reopening and expansion of the rail lines enhanced the transportation of goods and summer travelers to and from Loudoun County. The added attraction of

Loudoun County as a summer get-away from Washington D.C. spurred the economy of the county as a whole during the latter part of the nineteenth century.

This also led to modern enhancements and improvements to these smaller communities along the rail lines. By 1906, telephone service was established and by 1912, electricity was provided to the communities of Hamilton, Purcellville, and Round Hill. With the expansion and speed of the railroad, the turnpikes continued a slight decline; however, the major county roads were macadamized in the early part of the twentieth century, leading to better road transportation (Head 1908; Poland 1976).

3.11 WORLD WAR I TO WORLD WAR II (1917–1945)

Loudoun County, in the late nineteenth and early twentieth century, continued to be predominantly rural and agricultural, with the number of white residents remaining essentially unchanged over the past century. Nevertheless, the post-World War I-era ushered in significant changes in the county's farms. Agriculture became increasingly specialized, with an increasing emphasis on dairy farming, beef cattle, and poultry. In addition, during this time period, many younger men and women migrated from the rural countryside to urban centers, taking advantage of vocational training and job opportunities. This led to a general decline in the county's population (Head 1908; Poland 1976).

Federal programs to monitor and increase farm yields to help with the war effort appeared during WWI. At the end of the war, the levels of production returned to normal and an agricultural recession ensued which lasted until the outbreak of World War II. The majority of the population remained in the agricultural sector and in rural communities with modest income levels from farming. These families suffered from the Great Depression, with most of their earnings returned to the farms to keep them going. During World War II, the supply and demand for the agricultural produce from Loudoun County again boomed. Farming technology was boosted by World War II, as new machines to increase productivity that were spurned in the early twentieth century now became a necessity to keep up with the supply and demand (Head 1908; Poland 1976).

During the period between the wars, the main roads throughout the county were macadamized and allowed for better and faster transportation of goods to markets. The railroad continued to be the primary mode of transportation; however, the automobile was emerging as a dominant form of transportation near the end of WWII (Head 1908; Poland 1976). Route 643 (Sycolin Road) is seen on a 1944 map depicting scant residences in the surrounding area (Figure 6).

3.12 THE NEW DOMINION (1946–PRESENT)

After World War II, increasing suburbanization and agricultural mechanization and specialization overshadowed the moderately-sized family farm, which had formed the backbone of Loudoun County's economy since the late eighteenth century (Poland 1976). The majority of the inhabitants live in private residences on smaller tracts, with larger open agricultural fields of land that once grew corn, grains, and wheat. Today, much of the land is being developed to satisfy the need for new housing in the suburban areas around Leesburg.

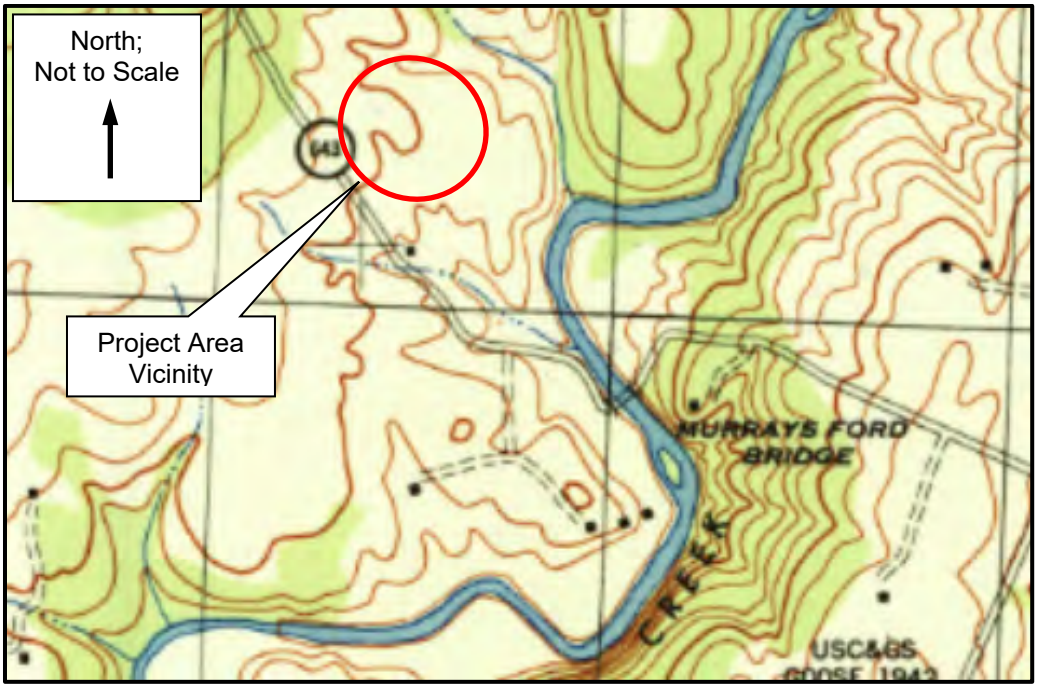


Figure 6. Detail of the 1944 *Leesburg, Virginia* USGS Topographic Quadrangle Map Depicting the Project area Vicinity (USGS 1944; http://historicalmaps.arcgis.com/usgs/, Accessed February 2019).

The nearest town to the project area is Hamilton, located in the Loudoun Valley at the base of the Catoctin Mountain. The town of roughly 700 inhabitants lies approximately eight miles west of Leesburg, the Loudoun County seat. While once the largest of the six towns in western Loudoun county, Hamilton is now a residential community. A major road historically and today, business Route 7 bisects the town. Also dividing Hamilton in half is the watershed divide between the Catoctin and Goose Creek watersheds, which represent the two largest drainage basins in western Loudoun County (Town of Hamilton, Virginia 2001).

4.0 RESEARCH DESIGN

4.1 OBJECTIVES

The purpose of this project was to conduct a Phase I archaeological survey for the proposed Wildwood Substation. The Phase I cultural resources survey was designed to locate and identify all archaeological resources within the survey corridor. Stantec designed the survey to obtain sufficient information to make recommendations about the research potential of identified cultural resources based on each resource's potential eligibility for listing on the NRHP. A cultural resource is gauged to be significant if it meets at least one of four NRHP criteria:

A. Associated with significant events in the broad patterns of national history.

B. Associated with the lives of persons significant in our past.

C. Representative of a type, period, or method of construction, or the work of a master.

D. Capable of yielding important information about the past.

Criterion D typically applies to archaeological sites. In order to be capable of yielding important information about the past, generally a site must possess artifacts, soil strata, structural remains, or other cultural features that make it possible to test historical hypotheses, corroborate and amplify currently available information, or reconstruct the sequence of the local archaeological record.

4.2 PREVIOUS INVESTIGATIONS

4.2.1 Archaeological Sites

One previously recorded archaeological site (44LD0468) is located within the Wildwood Substation project area. Forty-one previously recorded archaeological sites are located within a 1-mile radius of the project area (Table 2; Figure 7). Of the 42 total previously recorded archaeological sites in the vicinity of the project area, 17 are prehistoric, 18 are historic, and six are multicomponent. One site (44LD1195), a nineteenth-century dwelling and kiln, is eligible for listing on the NRHP. Four sites are not eligible for NRHP inclusion while the remaining 36 sites have not been formally evaluated by the VDHR for potential NRHP eligibility.

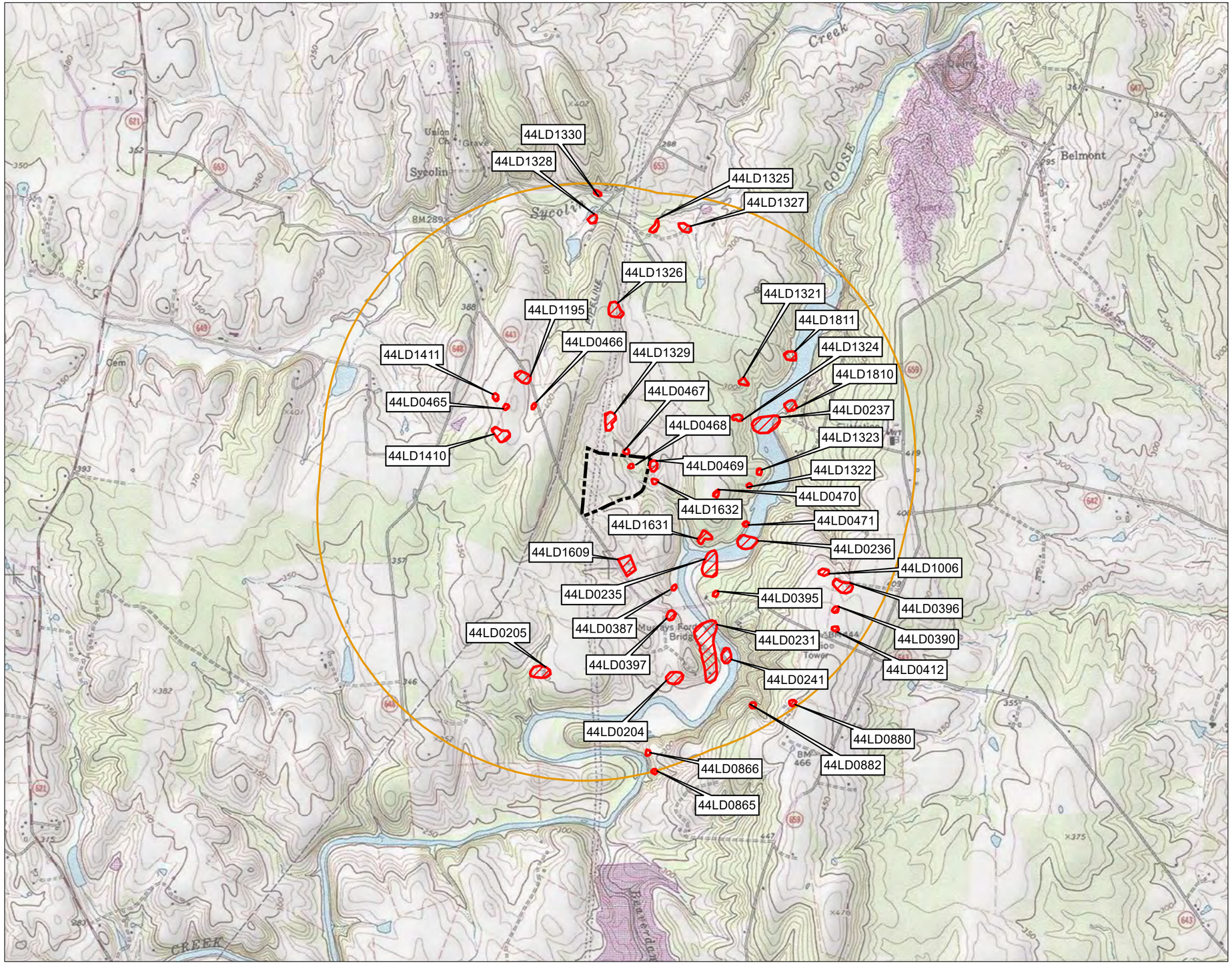


Figure No.
7

Title
Previously Identified Archaeological Sites within a 1-Mile Radius of the Project Area

Client/Project
NOVEC
Wildwood Substation
203401129

Project Location
Loudoun County, Virginia

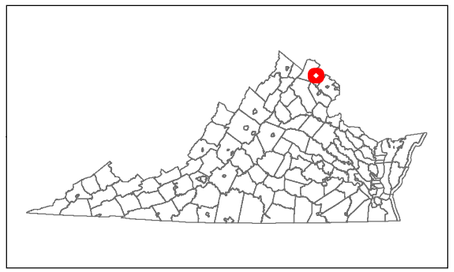
Prepared by ECL on 2019-02-01
TR by TPS on 2019-02-19
IR by BSS on 2019-02-15

N

0 2,000 4,000 Feet

(At original document size of 11x17)
1:24,000

Project Limits
Archaeological Resource
1-Mile Buffer



Notes
1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. Historic resource data provided by Virginia Department of Historic Resources, Virginia Cultural Resources Information System (VCRIS)
3. Topographic map © USGS 7.5 Minute Series Topographic Map

Stantec

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Table 2. Previously Identified Archaeological Sites within a 1-Mile Radius of the Project Area

Resource	Resource Type	Association	Reference	NRHP Status
44LD0204	Camp	Prehistoric Unknown	WMCAR 1997	Not Evaluated
44LD0205	Camp	Prehistoric Unknown	Rust 1981	Not Evaluated
44LD0231	Canal Lock	Historic Unknown	McCartney 1981	Not Evaluated
44LD0235	Canal Lock, Dam	Historic Unknown	McCartney 1981	Not Evaluated
44LD0236	Canal Lock, Dam	Historic Unknown	McCartney 1981	Not Evaluated
44LD0237	Canal Lock, Dam	Historic Unknown	McCartney 1981	Not Evaluated
44LD0241	Canal Lock, Mill	Historic Unknown	McCartney 1981	Not Evaluated
44LD0387	Lithic Scatter	Prehistoric Unknown	WAPORA, Inc. 1987	Not Evaluated
44LD0390	Artifact Scatter	Middle Archaic; 19th c.	WAPORA, Inc. 1987	Not Evaluated
44LD0395	Lithic Scatter	Prehistoric Unknown	WAPORA, Inc. 1987	Not Evaluated
44LD0396	Lithic Scatter; Farmstead	Late Woodland; 19th c.	WAPORA, Inc. 1987	Not Evaluated
44LD0397	Lithic Scatter	Prehistoric Unknown	Thunderbird 2018	Not Evaluated
44LD0412	Camp	Early Woodland	WAPORA, Inc. 1988	Not Evaluated
44LD0465	Artifact Scatter	Historic Unknown	WAPORA, Inc 1990	Not Evaluated
44LD0466	Lithic Scatter	Prehistoric Unknown	WAPORA, Inc 1990	Not Evaluated
44LD0467	Lithic Scatter	Prehistoric Unknown	WAPORA, Inc 1990	Not Evaluated
44LD0468	Lithic Scatter	Prehistoric Unknown	WAPORA, Inc 1990	Not Evaluated
44LD0469	Lithic Scatter; Artifact Scatter	Prehistoric Unknown; 19th c.	WSSI/TA 2013	Not Evaluated
44LD0470	Lithic Scatter	Prehistoric Unknown	WAPORA 1990	Not Evaluated
44LD0865	Camp	Prehistoric Unknown	Thunderbird 2002	Not Evaluated
44LD0866	Camp	Prehistoric Unknown	Thunderbird 2002	Not Evaluated
44LD0882	Artifact Scatter	19th c.	Thunderbird 2002	Not Evaluated
44LD0890	Trash Scatter	19th to 20th c.	Thunderbird 2002	Not Evaluated
44LD1006	Farmstead	20th c.	Thunderbird 2003	Not Evaluated
44LD1195	Single Dwelling; Kiln	19th c.	LBG 2006	Eligible (VDHR 2005)
44LD1321	Lithic Scatter	Prehistoric Unknown	Jacobs Engineering 2017	Not Eligible (VDHR 2018)
44LD1322	Camp	Prehistoric Unknown	WSSI 2005	Not Evaluated
44LD1323	Camp	Prehistoric Unknown	WSSI 2005	Not Evaluated
44LD1324	Camp; Single Dwelling	Prehistoric Unknown; 19th & 20th c.	TA/WSSI 2010	Not Eligible (VDHR 2018)
44LD1325	Camp	Prehistoric Unknown	WSSI 2005	Not Evaluated

44LD1326	Farmstead	20th c.	WSSI 2005	Not Eligible (VDHR 2013)
44LD1327	Farmstead	19th c.	WSSI 2005	Not Evaluated
44LD1328	Farmstead	20th c	Thunderbird 2005	Not Evaluated
44LD1329	Camp; Farmstead	Late Archaic; 20th c.	Thunderbird 2017	Not Evaluated
44LD1330	Farmstead	20th c.	Thunderbird 2005	Not Eligible (VDHR 2014)
44LD1410	Camp	Late Woodland	Sheppard 2006	Not Evaluated
44LD1411	Trash Scatter	Historic Unknown	Sheppard 2006	Not Evaluated
44LD1609	Farmstead	19th/20th c	WSSI/TA 2013	Not Evaluated
44LD1631	Lithic Scatter	Prehistoric Unknown	Thunderbird 2013	Not Evaluated
44LD1632	Lithic Scatter; Single Dwelling	Prehistoric Unknown; Historic Unknown	Dovetail 2013	Not Evaluated
44LD1810	Single Dwelling	20th c.	Thunderbird 2018	Not Evaluated
44LD1811	Single Dwelling	20th c.	Thunderbird 2018	Not Evaluated

***Highlighted Resources are Located within the Project Area**

4.2.2 Architectural Resources

No previously recorded architectural resources are located within the Wildwood Substation project area. Thirty-one previously recorded architectural resources are located within a 1-mile radius of the project area (Table 3; Figure 8). The architectural resources include 14 houses dating from circa 1794 to circa 1967 (VDHR #053-0383, #053-1097, #053-5217, #053-0203, #053-0208 to 0209, #053-0211, #053-0213 to 0214, #053-0226, #053-0262, #053-0271, #053-5276 to 5277, #053-6084, #053-6447 to 6454), an early twentieth-century bridge (VDHR #053-0249), a cemetery (VDHR #053-6361), three late nineteenth to early twentieth-century farmsteads (VDHR #053-0016, #053-5247, and #053-5354), a mid-twentieth-century barn (VDHR #053-5278), a canal lock (VDHR #053-0136), the Goose Creek Reservoir Dam (VDHR #053-6376), a late nineteenth-century landscape feature (VDHR #053-6396), and two circa 1900 stone walls (VDHR #053-6410 and #053-6411).

No resources have been listed on the NRHP or the Virginia Landmarks Register (VLR). Two resources (VDHR #053-0767 and VDHR #053-5276) have been determined to be potentially eligible for NRHP inclusion. Eight resources (VDHR #053-0376, #053-6084, #053-0136, #053-0018, #053-5278, #053-6361, #053-0269, and #053-6396. Four resources are no longer extant and the remaining 17 resources have not been formally evaluated for potential NRHP eligibility by the VDHR.

Table 3. Previously Identified Architectural Resources within a 1-Mile Radius of the Project Area

Resource	Resource Type	Date	Reference	NRHP Status
053-0016	Farm, Rt. 648	c.1870	Haynes 1989	Not Evaluated
053-0017	Stable, Generation Drive	c.1900	JMA, Inc. 2014	Demolished
053-0018	Cabin, Route 643	c.1750	Dollins 2007	Not Eligible (VDHR 2014)
053-0136	Canal Lock	c.1850	Kampinen 2014	Not Eligible (VDHR 2007)
053-0249	Luten Bridge, Rt. 643	c.1920	WMCAR 2014	Demolished (VDHR 2014)
053-0269	Luten Bridge, Old Route 643	c.1900	CRI, 2013	Not Eligible (VDHR 2014)
053-0366	Morrisworth	c.1780	Lewis 1978	Not Evaluated
053-0376	Stirling	c.1870	CRI 2013	Not Eligible (VDHR 2013)
053-0377	Cochrans Mill	c.1770	Lewis 1974	Not Evaluated
053-0383	Dupuy House Ruins; Lentz Mill	c.1794	Thunderbird 2018	Not Evaluated
053-0767	Murrays Ford Tennant House	c.1830	CRI 2013	Potentially Eligible (VDHR 2014)
053-0898	Hollyfield Farm	c.1750	Edwards 1981	Not Evaluated
053-1097	Koons House	c.1830	CRI 2013	Demolished (VDHR 2014)
053-5276	House, 41087 Cochran Mill Road	c.1881	Dutton 2018	Potentially Eligible
053-5277	House, 20136 Gant Lane	c.1840	URS Corp. 2003	Not Evaluated
053-5278	Barn, 20077 Gant Lane	c.1950	WMCAR 2014	Not Eligible (VDHR 2014)
053-5354	Farm, 21167 Belmont Ridge Rd.	c.1890	CRI 2013	Demolished
053-6084	House, Cochran Mill Road	Pre-1943	WMCAR 2014	Not Eligible (VDHR 2014)
053-6361	Etcher Family Cemetery	c.1846	Dovetail 2014	Not Eligible (VDHR 2015)
053-6376	Goose Creek Reservoir, Dam	1961	Thunderbird 2018	Not Evaluated
053-6396	Morrisworth Landscape Features	c.1880	Dovetail 2014	Not Eligible (VDHR 2015)
053-6410	Stone Wall, near Cisco Lane	Pre-1900	Thunderbird 2018	Not Evaluated
053-6411	Stone Wall, near Gant Lane	c.1900	Stantec 2015	Not Evaluated
053-6447	Ruinous House, north of 42400	c.1875	Thunderbird 2018	Not Evaluated
053-6448	Dwelling, 20280 Sycolin Road	1967	Dutton 2018	Not Evaluated
053-6449	Dwelling, 20254 Sycolin Road	1964	Dutton 2018	Not Evaluated
053-6450	Dwelling, 20244 Sycolin Road	1963	Dutton 2018	Not Evaluated
053-6451	Dwelling, 20226 Sycolin Road	1960	Dutton 2018	Not Evaluated
053-6452	Dwelling, 20210 Sycolin Road	1965	Dutton 2018	Not Evaluated
053-6453	Dwelling, Sycolin Road	1940	Dutton 2018	Not Evaluated
053-6454	Dwelling, Sycolin Road	c.1930	Dutton 2018	Not Evaluated

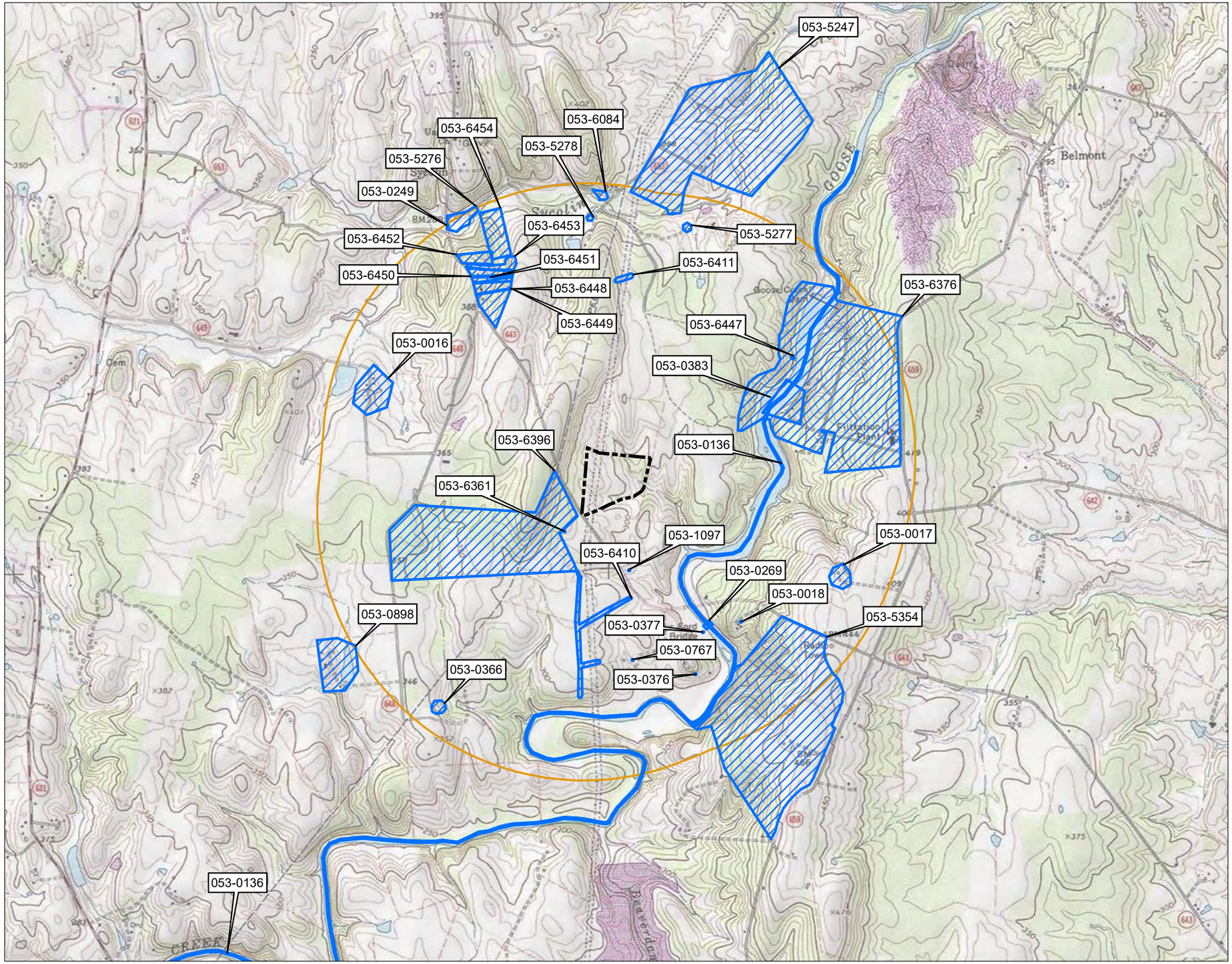


Figure No.

8

Title

Previously Identified Architectural Resources within a 1-Mile Radius of the Project Area

Client/Project

NOVEC
Wildwood Substation

203401129

Project Location

Loudoun County, Virginia

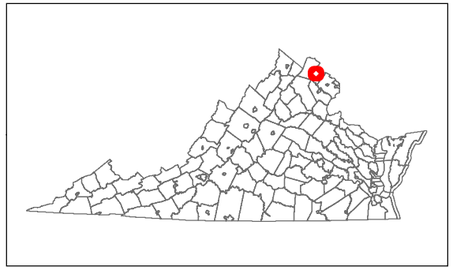
Prepared by ECL on 2019-02-01
TR by TPS on 2019-02-19
IR by BSS on 2019-02-15

N

0 2,000 4,000 Feet

(At original document size of 11x17)
1:24,000

Project Limits
Architectural Resource
1-Mile Buffer



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. Historic resource data provided by Virginia Department of Historic Resources, Virginia Cultural Resources Information System (VCRIS)
3. Topographic map © USGS 7.5 Minute Series Topographic Map

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5.0 SURVEY METHODOLOGY

5.1 ARCHAEOLOGICAL SURVEY

Stantec field personnel conducted visual inspection of the entire project area concurrently with systematic shovel testing. Shovel tests were excavated at 50-foot intervals along transects spaced 50 feet apart across the project area. Shovel testing was not conducted in areas exhibiting 15 percent or greater slope, that were wet or waterlogged, or exhibited obvious disturbances. Radial shovel tests were excavated at 25-foot intervals around each positive shovel test to determine the bounds of newly identified cultural resources.

All shovel tests measured approximately 1.25 feet (15 inches) in diameter and all soils excavated from the shovel tests were screened through 1/4-inch mesh hardware cloth. Depths of shovel tests were recorded in reference to the ground surface. Shovel tests were excavated stratigraphically, and close attention was paid to the distinction between the plow zone and the sub-plow zone when present. All shovel tests were excavated to sterile subsoil or the water table, whichever was encountered first. Descriptions of soil texture and color followed standard terminology and the Munsell (1994) soil color charts. All shovel test data was recorded on standard forms and identified on maps of the project area.

All pertinent data was recorded on a field map, including: the site location, the location of features, any permanent landmarks, the topography, the vegetation, any disturbed areas, and the location of surface survey and subsurface tests. The Stantec Archaeologists provided detailed notes to accompany the field forms and recorded field observations and interpretations, providing details about the site, soils, landforms, and any possible disturbance.

5.2 LABORATORY METHODS

All archaeological data and specimens collected during the project were transported to Stantec's laboratory in Richmond, Virginia, for processing and analysis. Prior to washing, artifacts from a given provenience were first emptied into a screened basket and sorted. Next, the provenience information from the field bags was confirmed with the bag catalog and transferred onto bag tags. Stable objects were washed with tap water using a soft brush, with careful attention paid to the edges of ceramics and glass to aid in the identification of body type and to assist in mending. Washed items were then placed by provenience on a drying rack.

Once dry, the artifacts were re-bagged by provenience and material type. Artifacts of a given provenience were placed in clean 2-millimeter thick re-sealable polyethylene bags that were perforated to allow air exchange. Each grouped material type was placed in a separate plastic bag (i.e., all glass in one bag, all brick fragments in one bag, etc.) and each of these individual type bags were then placed in a larger bag with the bag tag noting the provenience. After processing and re-bagging, the entire artifact assemblage was then cataloged for analysis. Stylistic attributes were described using current terminology and recorded by count into a database for analysis.

Once all the artifacts were cataloged, the ceramics were then pulled from their bags and marked with correct provenience information. Diagnostic ceramics were sorted out and grouped together based on type or ware and/or vessel or function and checked for cross mends.

Analysis of prehistoric lithic artifacts was aided by standard reference works (Justice 1995; also Broyles 1971; Coe 1964; Ritchie 1971). All materials generated by this project will be curated according to the standards outlined in 36 CFR Part 79 (“Curation of Federally-Owned and Administered Archaeological Collections”) and by VDHR. All processed artifact bags were deposited in acid-free Hollinger boxes for permanent storage and will eventually be returned to the property owner upon conclusion of the project.

5.3 DEFINITIONS

This field survey used two designations for archaeological resources: the *archaeological site* and the *isolated archaeological find*. An *archaeological site* is regarded as any apparent location of human activity not limited to simple loss, casual or single-episode discard, and having sufficient archaeological evidence to indicate that further testing would produce interpretable archaeological data. Three artifacts related temporally or functionally within a spatially restricted area constitute an archaeological site (VDHR 2017: Chapter 6, page 1). In contrast, an *isolated archaeological find* is defined as an area marked by surface indications and little else; containing three or less artifacts of a similar period; and/or representing an area reflecting simple loss, casual, or single-episode discard, all of which retain a low potential for providing additional interpretable archaeological data. By definition, archaeological resources of this type are not eligible for listing in the NRHP because they lack the ability to provide significant information about the prehistoric or historic past.

5.4 EXPECTED RESULTS

Native American sites are generally found within 1,000 to 1,500 feet of a significant water source, on moderately well- to well-drained soils on low relief landforms. Native American occupation of the region began more than 13,000 years ago (McAvoy and McAvoy 1997). Early historic maps have depicted Native American settlement along major waterways throughout the region since the arrival of Europeans in the New World in the early seventeenth century. Though no documentation for pre-Contact settlement exists, Native American occupation throughout the region has been documented archaeologically. One previously identified prehistoric site (44LD0468), a lithic scatter of indeterminate temporal affiliation, is located within the project area while 22 additional sites within 1 mile of the project area are prehistoric in nature or contain prehistoric components. There is a moderate to high potential for the identification of additional prehistoric resources within the project area.

Early European settlement in Virginia and the region relied heavily on the production of tobacco. As a result, settlement, which was initially restricted to the Jamestown Island area, began spreading to landscapes suitable for the cultivation of tobacco. Such areas exhibited gently sloping landscapes with well drained soils. Over time, settlement spread into the Piedmont region, where soil erosion due to heavy tobacco cultivation had not yet depleted agricultural soils (Farmer 1993). As time went on, overland

transportation routes began to improve, and settlement began to cluster around major roadways and crossroads.

Much of the Project Area comprises relatively level, well-drained land interspersed with minor areas of wetlands and/or steep slope. Twenty-four previously identified archaeological sites within 1 mile of the project area are historic in nature or contain historic components. Those previously recorded historic sites with temporal affiliations date generally from the nineteenth and twentieth centuries. Historic map review, however, has provided little to no evidence of occupation within the project area itself. There is a low to moderate probability of identifying additional nineteenth- to twentieth century historic resources within the project area.

6.0 ARCHAEOLOGICAL SURVEY RESULTS

6.1 INTRODUCTION

The project area is located in wooded parcel south of Dulles Greenway (Route 267). It is bounded on the east and west by woodland and on the south by an agricultural field and Sycolin Road (Route 643). A wide, cleared transmission line corridor extends along the western edge of the project area. Wetlands are present in the southwest corner and along the northern edge of the project area. Access roads were also present throughout the project area and some areas exhibited rock on the ground surface (Figures 9–12).

Figure 9. Transmission Line Corridor with Two-Track Access Disturbance in the Southwest Corner of the Project Area; View to the East.

Figure 10. **View of Woodlands from STP JU6, in Northeast Portion of the Survey Area; View to the West.**

Figure 11. **Woodland and Slope in the Southeast Corner of the Project Area; View to the South.**

Figure 12. **Stream and Associated Flagged Wetland in the Northern Portion of the Project Area; View to the East.**

6.2 SHOVEL TESTING

A total of 336 shovel tests were excavated at 50-foot intervals along 27 transects (Transects A–AA) spaced 50 feet apart throughout the project area. A total of 144 shovel tests were not excavated, due primarily to their location within areas of standing water or wet soils. Other impediments to shovel testing included roads, drainages, subsoil on surface, push piles, and other ground disturbances (Table 4). A total of three shovel tests were positive for cultural material and eight radial shovel tests were excavated at 25-foot intervals around positive holes to determinate the boundaries of newly identified cultural resources. One radial shovel test was positive for additional cultural material. One new isolated archaeological find (1129-IF1) was identified during this survey. In addition, one previously identified site (44LD0468) was re-identified and the boundaries expanded. In addition, two twentieth century trash dumps were noted in the southern portion of the site (Figure 13).

A representative shovel test profile for the majority of the proposed Wildwood Substation project area consisted of two strata (STP K14). Stratum I was characterized as a layer of 10YR4/6 dark yellowish brown sandy clay loam (Top Soil), which extended in depth from approximately 0 to 0.9 feet below ground surface. Underlying Stratum I was Stratum II, a layer of 10YR6/6 brownish yellow clay (Subsoil). Stratum II was excavated from approximately 0.9 to 1.3 feet below ground surface (Table 5).

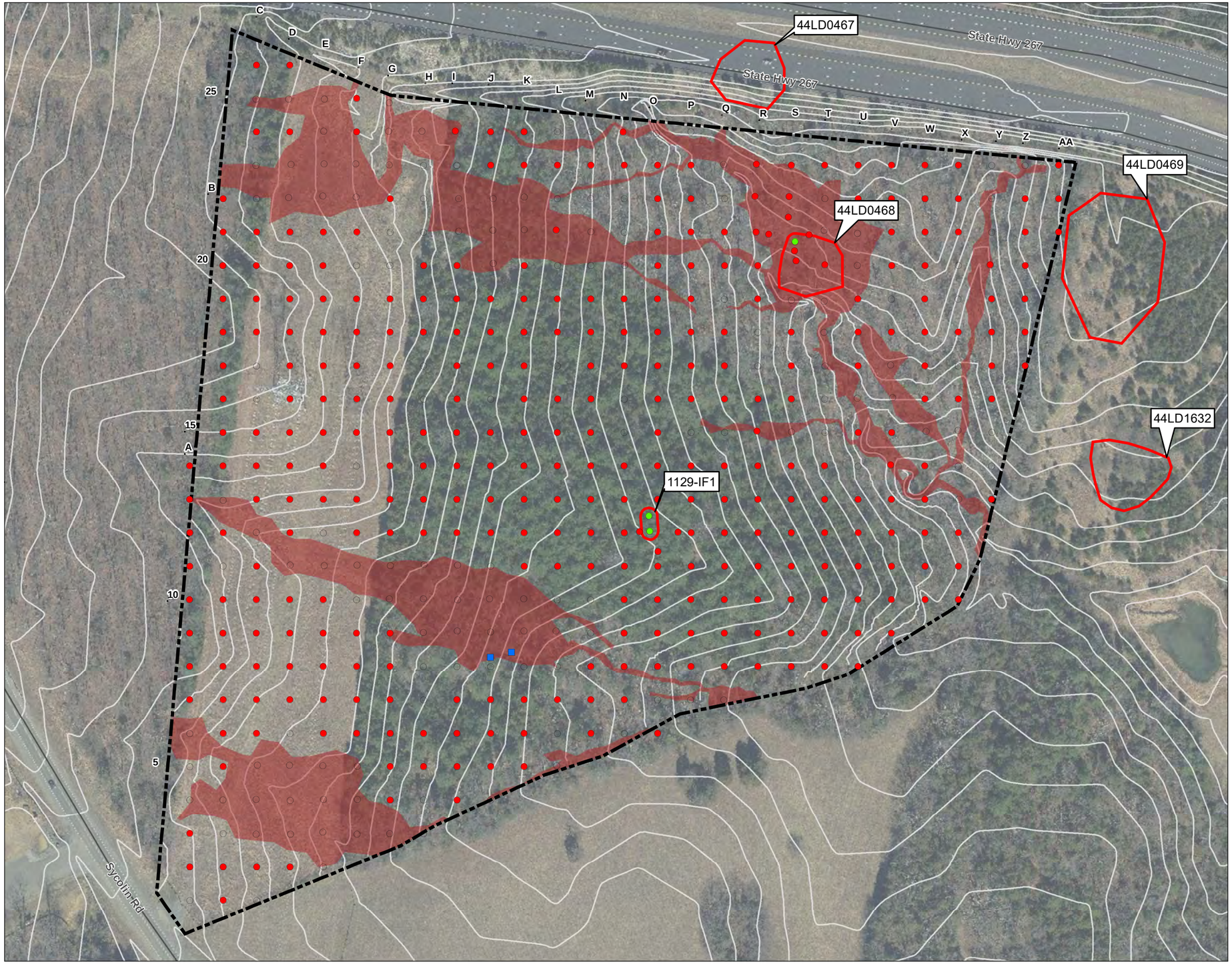


Figure No.

13

Title

Base Map of Shovel Test Locations in the Study Area

Client/Project 203401129

NOVEC
Wildwood Substation

Project Location

Loudoun County, Virginia

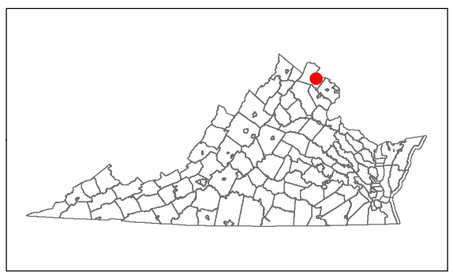
Prepared by ECL on 2019-02-15
TR by TPS on 2019-02-19
IR by BSS on 2019-02-15

N

0 150 300 Feet

(At original document size of 11x17)
1:1,800

- No Dig
- Negative
- Positive
- 20th c trash
- Project Limits
- Archaeological Resource
- No Survey Area (Wetlands Delineated)
- 2-Foot Contour



Notes

1. Coordinate System: NAD 1983 StatePlane Virginia North FIPS 4501 Feet
2. Survey Delineation, Topography, and Project Limits provided by Dewberry
3. The approximate limits of waters of the U.S., including wetlands, have not been field survey located and are for planning purposes only.
4. Orthoimagery © VGIN 2017

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Table 4. Explanation of Unexcavated Shovel Tests

STP Count	STP Number	Location
129	A4-6, B3-4, B11, B13, C3-5, C12, C22-23, C25, D11, D22-23, D25, E2-5, E11-12, E22-25, F3-5, F11, F22-23, G3, G10-11, G23-25, H3-4, H7-11, H16-17, H24, I8-11, I21-23, J4, J8-11, J16, J20-22, K8-10, K21-22, L5, L8-10, L17, L20-22, L24, M9-10, M20-22, M24, N6, N15-16, N20-22, O24, P15, P24, Q15, Q19, Q22-23, R17-18, S15, S19, T15-19, T21-22, T24, U14, U16, U20-21, V16-17, V19, W9, W15, X13-15, X17, X19-20, Y21-22, Z23	Wetlands
6	A1, C16-17, F10, F14, F20	Road
7	G20-21, H21-23, L6, Y23	Subsoil on Surface
2	Y14-15	Rock

Table 5. STP K14 Soil Profile

Stratum	Depth (ft.)	Color	Soil Type/Texture	Interpretation
I	0−0.9	10YR4/6 Dark Yellowish Brown	Sandy Clay Loam	Top Soil
II	0.9−1.3	10YR6/6 Brownish Yellow	Sandy Clay	Subsoil

6.3 LANDSCAPER FEATURES

Two twentieth century landscape features were observed during this investigation. Both features represented twentieth century trash dumps located in the southern portion of the project area. Both dump sites are located on wooded slope at the southern edge of wetlands (see Figure 13). These landscape features reflected the dumping of debris from other locations rather than former occupation within the project area. As such, they were not recorded as archaeological sites.

6.3.1 Landscape Feature 1

Landscape Feature 1 represented a twentieth century bottle dump in a stream bed. No intact bottles were observed, and the majority of the broken bottles appeared to represent large alcohol jugs, though beer bottles were also present (Figure 14).

6.3.2 Landscape Feature 2

Landscape Feature 2 represented a twentieth century trash dump in wooded wetlands. This dump was located a short distance northeast of Landscape Feature 1 and included a metal bed frame and other debris (Figure 15).

Figure 14. **Landscape Feature 1 – Twentieth Century Bottle Dump; View to the North.**

Figure 15. **Landscape Feature 2 – Twentieth Century Trash Dump; View to the East.**

6.4 NEWLY RECORDED ISOLATED ARCHAEOLOGICAL FINDS

One new isolated archaeological find was identified during Phase I survey of the Wildwood Substation project area.

6.4.1 Isolated Archaeological Find 01129-IF1

Originally identified on Transect O in Shovel Test 12, Isolated Archaeological Find 01129-IF1 consisted of two quartz tertiary flakes (Appendix A). STP O12 contained two strata in profile. Stratum I was characterized as a layer of 10YR3/4 dark yellowish brown sandy loam (Plow Zone), which extended in depth from approximately 0 to 0.2 feet below ground surface. Underlying Stratum I was Stratum II, a layer of 10YR4/6 dark yellowish brown clay (Subsoil). Stratum II was excavated from approximately 0.2 to 0.6 feet below ground surface (Table 6).

Table 6. STP O12 Soil Profile

Stratum	Depth (ft.)	Color	Soil Type/Texture	Interpretation
I	0–0.2	10YR3/4 Dark Yellowish Brown	Loam	Plow Zone
II	0.2–0.6	10YR4/6 Dark Yellowish Brown	Clay	Subsoil

The original shovel test yielded one quartz tertiary flake. Four radial shovel tests were excavated to determine the bounds of Isolated Find 01129-IF1. One radial shovel test (STP O12 North) was positive for additional cultural material, and one additional quartz tertiary flake was recovered. ***By definition, Isolated Archaeological Find 01129-IF1 is not eligible for listing on the NRHP.***

6.5 PREVIOUSLY IDENTIFIED ARCHAEOLOGICAL SITES

One previously identified archaeological site (44LD0468) was located within the project area and was reidentified during the survey.

6.5.1 Site 44LD0468

Site Date: Prehistoric Unknown
Site Type: Lithic Scatter
Site Size: 125 feet EW by 75 feet NS
Survey Methodology: Pedestrian Survey, 50-ft. Interval Shovel Testing, & 25-ft. Interval Radial Testing
Total Shovel Test Pits: 10
Positive Shovel Test Pits: 1
Prehistoric Artifacts: 1
Historic Artifacts: 0
Features: None
Recommendations: Not Eligible; No further work

Site 44LD0468 is located near the northern edge of the project area, a short distance from Dulles Greenway (Route 267). As mapped in V-CRIS, the site currently falls within wooded wetlands (see Figure 13; Figure 16). The site was originally identified in 1990 by WAPORA, Inc. during Phase I cultural resources survey associated with the Dulles Toll Road extension. The site was recorded as a prehistoric lithic scatter of indeterminate temporal affiliation and has not been formally evaluated for potential NRHP eligibility (V-CRIS Site Form, Accessed 2019).

Figure 16. **General Vicinity of Site 44LD0468 in Wooded Wetlands; View to the East.**

A representative shovel test for Site 44LD0468 consisted of two strata in profile (STP S21). Stratum I was characterized as a layer of 10YR3/4 dark yellowish-brown loam, which extended in depth from approximately 0 to 0.5 feet below ground surface (Topsoil). Underlying Stratum I was Stratum II, a layer of 10YR5/4 yellowish-brown clay. Stratum II was excavated from approximately 0.5 to 0.9 feet below ground surface (Subsoil) (Table 7).

Table 7. STP S21 Soil Profile

Stratum	Depth (ft.)	Color	Soil Type/Texture	Interpretation
I	0–0.5	10YR3/4 Dark Yellowish Brown	Loam	Topsoil
II	0.5–0.9	10YR5/4 Yellowish Brown	Clay	Subsoil

Site 44LD0468 was subject to systematic shovel testing during this investigation. Though located in formal wetlands, some of the ground within the site boundary was dry enough to walk through and shovel test. A total of six shovel tests were excavated at 50-foot intervals throughout the site, one of which (STP S21) was positive for cultural material. Four radial shovel tests were excavated at 25-foot intervals around

the positive hole but none were positive for additional cultural material. The positive shovel test was located just outside the known boundaries for the site; however, the recovered cultural material was similar to that collected during the original identification of Site 44LD0468 in 1990. As a result, the site boundary was increased (Appendix B). During the 2019 survey, a single artifact was recovered from Site 44LD0468. STP S21 yielded one complete quartz tertiary flake (Table 8; Appendix A).

Table 8. Artifacts Recovered from Site 44LD0468

ArtGroup	Object	Type 1	Type 2	Type 3	STP	Stratum	Total
Lithic	Flake	Quartz	Tertiary	Complete	STP S21	I	1
Lithic Total							**1**
Grand Total							**1**

Recommendations: Site 44LD0468 is located within the northeastern portion of the Wildwood Substation project area. The site, a non-diagnostic lithic scatter, is located within a wooded wetland. The single artifact recovered during this effort was collected from the top soil and represented a non-diagnostic flake. Given the paucity of artifacts, the location of the site within wetlands, and the non-diagnostic nature of the material originally identified, Site 44LD0468 appears to retain little research potential. As such, ***Stantec recommends Site 44LD0468 as not eligible for inclusion on the NRHP under Criterion D; Criteria A through C were not considered applicable to the evaluation of this resource.***

7.0 CONLUSIONS AND RECOMMENDATIONS

From February 5–7, 2019, Stantec conducted an archaeological survey of approximately 27.59 acres associated with the proposed Wildwood Substation in Loudoun County, Virginia. The project area is located south of Dulles Greenway (Route 267) and east and northeast from Sycolin Road (Route 643) and is comprised of a wooded parcel with a cleared transmission line corridor forming the western boundary of the parcel. One previously identified archaeological site (44LD0468) is located within the bounds of the project area. The site, a prehistoric lithic scatter of indeterminate temporal affiliation, has not been formally evaluated for NRHP eligibility. The work was conducted at the request of the NOVEC.

The Phase I survey was designed to locate and identify cultural resources within the defined project area and to obtain sufficient information to make recommendations regarding their potential eligibility for listing in the NRHP. The overall project area encompassed approximately 27.59 acres in extent. However, a preliminary environmental review was conducted in May of 2018, and identified approximately 8.87 acres of wetlands and document approximately 5.28 acres of actual wetland. As a result, only approximately 22.31 acres of the project area were subject to systematic survey.

Phase I survey included pedestrian survey of the entire project area, minus wetlands, conducted concurrently with systematic subsurface testing. A total of 336 shovel tests were excavated within the project area at 50-foot intervals along 27 transects (Transects A–AA) spaced 50 feet apart. A total of 144 shovel tests were not excavated due primarily to their location within wetlands, standing water, roads, push piles, and other surface disturbances. Three shovel tests were positive for cultural material and a total of eight radial shovel tests were excavated at 25-foot intervals around positive tests to determine the boundaries of newly identified cultural resources. One radial shovel test was positive for additional cultural material and one new isolated archaeological find (1129-IF1) was identified during this investigation (Table 9). ***By definition, isolated archaeological finds are not eligible for NRHP inclusion.***

In addition to the isolated find, one previously recorded archaeological site (44LD0468) was reidentified (Table 9). Site 44LD0468 was recorded in 1990 as a prehistoric lithic scatter of indeterminate temporal affiliation. The current survey identified one flake in the site vicinity, resulting in the expansion of the site boundary. Given the paucity of artifacts recovered, the lack of diagnostic material, and the location of the site within wetlands, ***Stantec recommends Site 44LD0468 as not eligible for listing on the NRHP under Criterion D; Criteria A through C were not considered applicable to the evaluation of this resource. No further archaeological work is recommended for the proposed Wildwood Substation project area.***

Table 9. Recommendations for Cultural Resources in the Project Area

Resource	Resource Type	Association	Stantec Recommendation
1129-IF1	2 Quartz Flakes	Prehistoric Unknown	Not Eligible; No Further Work
44LD0468	Lithic Scatter	Prehistoric Unknown	Not Eligible; No Further Work

8.0 REFERENCES

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PHASE I ARCHAEOLOGICAL SURVEY OF APPROXIMATELY 27.59 ACRES ASSOCIATED WITH THE PROPOSED WILDWOOD SUBSTATION, LOUDOUN COUNTY, VIRGINIA

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Appendix A ARTIFACT INVENTORY

Wildwood Ph I

Context	**Count and Description**

1129-IF1

F.S.#: 1, Transect O ST 12, Stratum I, Level 1 0N 0E

1 Lithic Fragment, quartz, 0% cortex, 3cm L, flake, tertiary

F.S.#: 2, Transect O ST 12n, Stratum I, Level 1 0N 0E

1 Lithic Complete object, quartz, 0% cortex, 2cm L, flake, tertiary

44LD0468

F.S.#: 3, Transect S ST 21, Stratum I, Level 1 0N 0E

1 Lithic Complete object, quartz, 0% cortex, 2cm L, flake, tertiary

Appendix B V-CRIS SITE FORM

Snapshot

Date Generated: March 14, 2019

Site Name: No Data
Site Classification: Terrestrial, open air
Year(s): 15000 B.C.E - 1606 C.E
Site Type(s): Lithic scatter
Other DHR ID: No Data
Temporary Designation: No Data

Site Evaluation Status

Not Evaluated

Locational Information

USGS Quad: LEESBURG
County/Independent City: Loudoun (County)
Physiographic Province: Piedmont
Elevation: 285
Aspect: Flat
Drainage: Potomac
Slope: 0 - 2
Acreage: 0.160
Landform: Other
Ownership Status: Private
Government Entity Name: No Data

Site Components

Component 1

Category: Industry/Processing/Extraction
Site Type: Lithic scatter
Cultural Affiliation: Native American
DHR Time Period: Pre-Contact
Start Year: -15000
End Year: 1606
Comments: April 1990

Bibliographic Information

Bibliography:

No Data

Informant Data:

No Data

CRM Events

Event Type: Survey:Phase I

Project Staff/Notes:

Senior Principal Investigator Brynn Stewart provided general direction and the research strategy for the project. Project Archaeologist Donald Sadler co-authored the report with Ms. Stewart. Crew Chief Emily Swain directed the fieldwork with assistance from Archaeological Field Technicians Ashley Bocan and Patrick Mumma. Artifact analysis was conducted by Laboratory Director Emily Curme. Copies of all field notes, maps, correspondence, and historical research materials are on file at Stantec's main office in Richmond, Virginia.

Project Review File Number: No Data

Sponsoring Organization: No Data

Organization/Company: Stantec 2034

Investigator: Brynn Stewart

Survey Date: 2/5/2019

Survey Description:

A total of 336 shovel tests were excavated at 50-foot intervals along 27 transects (Transects A–AA) spaced 50 feet apart throughout the project area. A total of 144 shovel tests were not excavated, due primarily to their location within areas of standing water or wet soils. Other impediments to shovel testing included roads, drainages, subsoil on surface, push piles, and other ground disturbances (Table 4). A total of three shovel tests were positive for cultural material and eight radial shovel tests were excavated at 25-foot intervals around positive holes to determinate the boundaries of newly identified cultural resources. One radial shovel test was positive for additional cultural material. One new isolated archaeological find (1129-IF1) was identified during this survey. In addition, one previously identified site (44LD0468) was re-identified and the boundaries expanded

Current Land Use	Date of Use	Comments
Forest	2/5/2019 12:00:00 AM	Stantec 2019: The site is located in wooded wetlands.

Threats to Resource: Development

Site Conditions: Unknown Portion of Site Destroyed

Survey Strategies: Observation, Subsurface Testing

Specimens Collected: Yes

Specimens Observed, Not Collected: No

Artifacts Summary and Diagnostics:

Stantec 2019: One artifact was recovered from the site, a single non-diagnostic complete quartz tertiary flake.

Summary of Specimens Observed, Not Collected:

No Data

Current Curation Repository: Stantec

Permanent Curation Repository: VDHR

Field Notes: Yes

Field Notes Repository: Stantec

Photographic Media: Digital

Survey Reports: Yes

Survey Report Information:

Sadler, Donald and Brynn Stewart
2019 Phase I Archaeological Survey of Approximately 27.59 Acres Associated with the Proposed Wildwood Substation, Loudoun County, Virginia.

Survey Report Repository: Stantec

DHR Library Reference Number: No Data

Significance Statement: Stantec 2019: Site 44LD0468 is located within the northeastern portion of the Wildwood Substation project area. The site, a non-diagnostic lithic scatter, is located within a wooded wetland. The single artifact recovered during this effort was collected from the top soil and represented a non-diagnostic flake. Given the paucity of artifacts, the location of the site within wetlands, and the non-diagnostic nature of the material originally identified, Site 44LD0468 appears to retain little research potential. As such, Stantec recommends Site 44LD0468 as not eligible for inclusion on the NRHP under Criterion D; Criteria A through C were not considered applicable to the evaluation of this resource.

Surveyor's Eligibility Recommendations: Recommended Not Eligible

Surveyor's NR Criteria Recommendations, : No Data

Surveyor's NR Criteria Considerations: No Data

Event Type: Survey:Phase I/Reconnaissance

Project Staff/Notes:

No Data

Project Review File Number: No Data

Sponsoring Organization: No Data

Organization/Company: Unknown (DSS)

Investigator: WAPORA-Alan Shettel, Haynes

Survey Date: 4/1/1990

Survey Description:

Shovel test pits, avg. width 35cm, dug at 12.5 and 25 meter intervals.

Current Land Use	Date of Use	Comments
Forest	*No Data*	*No Data*

Threats to Resource: No Data

Site Conditions: Site Condition Unknown

Survey Strategies: Subsurface Testing

Specimens Collected: Yes

Specimens Observed, Not Collected: Yes

Artifacts Summary and Diagnostics:

For Artifact inventory, see attached sheet; Interim depository, WAPORA, Inc. 7296 Jones Branch Drive; McLean, VA 22102; Permanent depository, VDHR
Prehistoric lithics

Summary of Specimens Observed, Not Collected:

No Data

Current Curation Repository: WAPORA

Permanent Curation Repository: No Data

Field Notes: No

Field Notes Repository: No Data

Photographic Media: No Data

Survey Reports: No Data

Survey Report Information:

Dulles Toll Road Extension: Phase I Cultural Resources Survey of the Selected Alignment, John Haynes, WAPORA, Inc., McLean, Virginia, 1990.

Survey Report Repository: WAPORA

DHR Library Reference Number: No Data

Significance Statement: No Data

Surveyor's Eligibility Recommendations: No Data

Surveyor's NR Criteria Recommendations, : No Data

Surveyor's NR Criteria Considerations: No Data

Appendix C KEY PERSONNEL RESUMES

Donald Sadler, MA

Project Archaeologist

Mr. Sadler has over 18 years of professional experience as an archaeologist. He has excavated on sites across Virginia, including Jamestown, as well as Greece, Bermuda, Georgia and Maryland, on both academic and professional projects. He has over a decade of experience as the primary field archaeologist supervising excavations at the Phase I, II and III levels involving the prehistoric and Euro-American history of the Chesapeake region. His duties at have included Phase I and II evaluations as a field technician and Field Supervisor. He has also assisted Senior Principal Investigators in report writing, management summaries, and historic research. Donnie has experience in historic ceramic analysis, 18th-century material culture analysis, managing archaeological collections, and database management.

EDUCATION

Master of Arts, Historical Archaeology, College of William and Mary, Williamsburg, Virginia, 2006

Bachelor of Arts, Anthropology with Honors, minor in History, College of William & Mary, Williamsburg, Virginia, 2001

CERTIFICATIONS & TRAINING

HAZWOPER 40 hour Certificate, Statewide, Virginia, 2018

Confined Space Awareness Training, Statewide, Virginia, 2016

RPA certified course “Metal Detecting for the Archaeologist”, Nationwide, US, 2015

PROJECT EXPERIENCE

Data Recovery of Site 44JC0664, James City County, Virginia

Donald oversaw the data recovery effort for Site 44JC0664, a Colonial era domestic site with a Civil War encampment component. Donald managed all field staff, monitored mechanical excavations, participated in feature excavation, and participated in photodocumentation of the site as well as the production of scale drawings. The site was situated within an active construction zone and Donald coordinated with on-site contractors and ensured that all staff followed safety protocol. Donald is currently synthesizing the recovered data and writing a detailed technical report describing the results of the investigation.

Documentary Research for the Sammons Cemetery, Albemarle County, Virginia

Documentary Research for the Sammons Cemetery. Report on file at the Virginia Department of Transportation (VDOT) in Richmond, Virginia.

City of Fredericksburg - Phase I Archaeological Survey, Phase II Evaluation, and Phase III Data Recovery for the Proposed Courthouse Facility at the Intersection of Princess Anne and Charlotte Streets, (Southeastern Quadrant of Block 42), City of Fredericksburg, Virginia

Three-stage archaeological investigation of a historic domestic site in the City of Fredericksburg in advance of the construction of a new Courthouse facility. The project resulted in the identification of 18th and 19th century domestic deposits including a Civil War period cellar dating to 1863. Work included archaeological fieldwork, extensive historic research, site interpretation, and final reporting. Also included was the development of an interpretive display featuring the sites to satisfy public participation requirements and highlight the significance of the lot and the site. Responsibilities included field supervision and direction for all fieldwork, field notes, and reporting.

Phase IA/Stage I Analysis for the Proposed Dominion Virginia Power Warrenton-Wheeler-Gainesville 230 kV Transmission Line Project, Fauquier and Prince William Counties, Virginia

Donald managed a cultural resources crew for the completion of a Phase IA/Stage I Cultural Resources Assessment for the proposed ~ 20 mile Warrenton-Wheeler-Gainesville 230 kV Transmission line project.

A Phase I Cultural Resources Survey of Approximately 9.4 Miles of the Proposed Dominion Virginia Power Dahlgren 230 kV Transmission Line*, King George County, Virginia

Donald and crew conducted a Phase I Cultural Resources Survey of a proposed Dominion Power 230kV utility line in King George County, Virginia. The proposed route of the Dahlgren line covers a distance of approximately 9.4 miles. Work included archaeological and architectural survey for the APE defined by the project for the entire corridor.

** denotes projects completed with other firms*

Donald Sadler, MA

Project Archaeologist

A Phase I Cultural Resources Survey of Approximately 39.0 Miles of Proposed Improvements to the Dominion Virginia Power 500 kV Transmission Line from the Lexington Substation to the Dooms Substation, Augusta and Rockbridge Counties, Virginia

Donald and crew conducted a Phase I Cultural Resources Survey of a proposed Dominion Power 230kV utility line in August and Rockbridge counties, Virginia. The proposed route of the Lexington to Doom line covers a distance of approximately 39 miles. Work included archaeological and architectural survey for the APE defined by the project for the entire corridor.

Benns Church Substation Rebuild Project, Isle of Wight County, Virginia

Donald directed the field effort for a Phase I survey of approximately 3.332 acres associated with the Dominion Virginia Power Benns Church Substation Rebuild Project and Phase II evaluation of Site 44IW0275, a Woodland period temporary camp site. Responsibilities included directing field staff in systematic shovel testing and test unit excavation, photodocumentation of the project APE and Site 44IW0275, and the production of scale drawings associated with the Phase II evaluation effort.

Dahlgren 230 kV Transmission Line Project, King George County, Virginia

Mr. Sadler led the field effort for a Phase I survey of approximately 9.4 miles associated with the Dominion Virginia Power Dahlgren 230 kV Transmission line project in King George County, Virginia. Mr. Sadler was responsible for crew management, coordination with local landowners, systematic shovel testing, and recordation.

VDOT - Archaeological Survey for Proposed Improvements to I-64, Segment 2, James City and York Counties, Virginia

Archaeological survey support for proposed improvements to Segment 2 of the I-64 improvement project in James City and York Counties Virginia. The project included archaeological survey of approximately 7 miles of proposed roadway improvements and expansion. The project included traditional archaeological survey as well as metal detecting for military related resources. Responsibilities included field supervision and direction for all fieldwork, field notes, and reporting.

US Coast Guard Training Facility, Yorktown – Archaeological Monitoring for Water Line Replacement*, Yorktown, Virginia

As subconsultant to TetraTech Tesoro, Donald provided archaeological monitoring for the replacement of a water line supporting the USCG TRACEN facility. The water line crossed the NRHP-listed Yorktown National Battlefield. Services included daily on-site monitoring, recordation of soil profiles and conditions and documentation of archaeological deposits.

Fort Monroe – On-call Archaeological Support Services, Fort Monroe, Hampton, Virginia

Donald provided on-call archaeological support services to the Fort Monroe Authority, Hampton, Virginia. Fort Monroe is a former Army Base a portion of which was transferred to the Commonwealth of Virginia in 2011. Services provided included emergency response services, Phase I level archaeological survey, archaeological monitoring, and reporting.

Cemetery Verification and Delineation Study for Site 44KG0223 along the Proposed Dominion Virginia Power Dahlgren 230 kV Transmission Line, King George County, Virginia

Donald led the field effort, monitoring mechanical excavations to identify potential grave shaft features and overseeing the metal detecting effort. The project proved that the site did not extend into the proposed transmission line right-of-way.

Cemetery Removal and Reburial at the Abberly at Stafford Development, Stafford County, Virginia

Donald assisted with a cemetery documentation and excavation of 29 burial features at Abberly in Stafford County, Virginia. The project included documentation, removal and reburial of the cemetery. Responsibilities included directing the field effort and documenting and removing burial features.

Cemetery Recovery for the Abberly at Stafford Development, Stafford County, Virginia

Donald led the field effort, monitoring mechanical excavations to identify potential grave shaft features and overseeing and participating in the archaeological recovery of human remains. Donald managed field staff during the recovery effort and assisted with the reburial effort.

** denotes projects completed with other firms*

Brynn Stewart, MA

Program Manager/Senior Principal Investigator

Brynn is the Program Manager/Senior Principal Investigator for Cultural Resources in Stantec's Williamsburg, Virginia, office. She has over 14 years of experience in cultural resources management. Brynn meets the Secretary of the Interior's standards and guidelines for a professional archaeologist. She has served as a Principal Investigator and Project Archaeologist on numerous transportation and energy-related projects as well as private development projects.

Brynn manages in-house technical staff, supervises technical document preparation, and provides quality control and peer review for cultural resources studies. Her expertise includes all phases of cultural resource management (archaeological assessments and Phase I, II, and III excavations) in compliance with local, state, and federal laws and regulations. Brynn's experience includes managerial tasks associated with all aspects of cultural resource management projects such as consultation with and representation of clients before state and national review agencies, writing and editing technical reports, preparing and managing project budgets, and developing and implementing archaeological research designs.

Brynn also has experience in the processing and analysis of artifact collections with special interest in Colonial-era ceramics and lithic analysis and the development and production of interpretive materials including pamphlets and exhibits.

EDUCATION

Master of Arts, Anthropology, University of Nevada, Las Vegas, Nevada, 2009

Bachelor of Arts, Anthropology, Washington College, Chestertown, Maryland, 2004

CERTIFICATIONS & TRAINING

OSHA Excavation Safety: Satisfies 29 CFR 1926.650

OSHA Confined Space Safety: Satisfies 29 CFR 1910.246, 29 CFR 1926.1001, 29 CFR 1915.1001

PROJECT EXPERIENCE

Ore Bank Undergrounding Project, Rockingham County, Virginia

Brynn served as Principal Investigator, developing a proposed scope of work and budget prior to the awarding of the project. Brynn directed pre-fieldwork planning and managed field personnel. She was responsible for coordinating with the Civil War Trust and will author the technical report upon completion of on-going investigations.

Abberly at South Campus Development, Stafford County, Virginia (Principal Investigator)

Brynn served as Principal Investigator, developing a proposed scope of work and budget prior to the awarding of the project. She directed pre-fieldwork planning, managed field personnel, and participated in Phase II evaluation of Site 44ST1141. Brynn synthesized data collected during evaluation and served as the lead author of the resulting technical report.

Data Recovery of Sites 44PW1305 and 44PW1306 for the Eagles Pointe Landbay A Section 2 Development Project, Prince William County, Virginia

Brynn is serving as Principal Investigator for this on-going project. She developed the scope of work and budget prior to the awarding of the project. Brynn coordinated with the client and the County Archaeologist on the Data Recovery Plan she developed. She has managed field personnel and coordinated with the VDHR to procure both an Anticipatory Permit and a Burial Permit for the excavation of a single burial identified within Site 44PW1306. Brynn coordinated the placement of public notice as part of the Burial Permit and gave a presentation concerning the burial feature to the Prince William County Historical Commission, which served as a public meeting as a result of responses received for the said public notice. Brynn is currently coordinating the reburial of the recovered remains with a local cemetery and will author the resulting technical report.

** denotes projects completed with other firms*

Brynn Stewart, MA

Program Manager/Senior Principal Investigator

Stantec

Data Recovery of Site 44JC0662, James City County, Virginia

Brynn served as Principal Investigator, directing pre-fieldwork planning and overseeing the field effort. Brynn participated in feature excavation. She coordinated the field effort with the client as well as site inspectors and was responsible for coordinating with local Native American tribal representatives with an interest in the project. Brynn participated in shovel testing and monitoring activities, synthesized the data collected during the project, and served as lead author on the resulting technical report.

Poplar Grove National Cemetery Archaeological Investigations and Monitoring, Dinwiddie County, Virginia

Brynn served as Principal Investigator, coordinating with the NPS and field staff. The NPS conducted rehabilitation at the cemetery, including the replacement of 5,700 headstones, rehabilitation of the Superintendent's lodge, restoration of site furniture and signs, replacement of the flagpole and site utilities, preservation of the cemetery wall, and rehabilitation of the landscape. Brynn participated in shovel testing and monitoring activities, synthesized the data collected during the project, and served as lead author on the resulting technical report.

Berkmar Data Recovery, Charlottesville, Virginia

Brynn served as Principal Investigator, assisting in the development of a scope of work and budget prior to the awarding of the project. Brynn directed pre-fieldwork planning and managed field personnel. She was responsible for coordinating with client representatives, conducting excavations, compiling and interpreting fieldwork results, on-going lithic analysis, and is in the process of co-authoring the resulting technical report.

Trowbridge-Pantego Transmission Line Project, Washington and Beaufort Counties, North Carolina

Brynn served as Principal Investigator, coordinating with Project Managers and field personnel. Brynn directed pre-fieldwork planning and was responsible for compiling and interpreting fieldwork results. She is currently in the process of co-authored the resulting technical report.

Fredericksburg Courthouse Project, City of Fredericksburg, Virginia

Brynn served as Principal Investigator, directing pre-fieldwork planning and managing field personnel during Phase I, Phase II, and Phase III investigations of eighteenth-century through nineteenth-century deposits. She also participated in fieldwork, synthesized data collected during all three phases of work, and served as the lead author of the resulting technical report. She helped develop and produce a public exhibit of artifacts on display in the new Courthouse.

Dominion Virginia Power Splice Pit within the Colonial National Historic Park, James City County, Virginia

Brynn served as Principal Investigator, leading the field effort and interpreting data post-field effort. She also authored the resulting technical report.

Mosby Substation (Laydown Yard and Storm Water Management Basin Area) Project, Loudoun County, Virginia

Brynn served as Principal Investigator, managing the field effort and interpreting data post-field effort. She also authored the resulting technical report.

Goose Creek to Loudoun 500kV Transmission Line Improvement Project, Loudoun County, Virginia

Brynn served as Principal Investigator, developing a proposed scope of work and budget prior to the awarding of the project. Brynn directed pre-fieldwork planning and managed field personnel. She was responsible for coordinating with client representatives, compiling fieldwork results, interpreting sites, entering site data into V-CRIS, and co-authoring the resulting technical report.

Warren County Power Station Proposed Auxiliary Parking Lot, Warren County, Virginia

Brynn served as Principal Investigator, developing a proposed scope of work and budget prior to the awarding of the project. Brynn directed pre-fieldwork planning and managed field personnel. She was responsible for compiling fieldwork results and authoring the resulting technical report.

** denotes projects completed with other firms*

APPENDIX G –
COMPENSATORY MITIGATION

Received by VMRC February 4, 2021 /blh

Stream Assessment Summary Form (Form 2)

Unified Stream Methodology
for use in Virginia

Project #	Applicant		Date
203401129	NOVEC		3/11/2020
Evaluators		HUC	Locality
J. Mann		02070008	Loudoun

Stream Name	Reach ID	Length of Impact (L_I) (feet)	Reach Condition Index (RCI)	Impact Factor (IF)	Compensation Requirement (CR) ($L_I \times RCI \times IF$)
Unnamed tributary to Goose Creek	1	77	1.04	1.00	80
Unnamed tributary to Goose Creek	2	239	1.05	1.00	251
Unnamed tributary to Goose Creek	3	194	1.18	1.00	229
	Total L_I	**510**		**Total CR**	**560**

Note: Round all feet & CR's to the nearest whole number.

Received by VMRC February 4, 2021 /blh

Stream Assessment Form (Form 1)

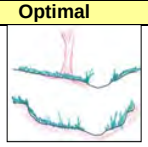
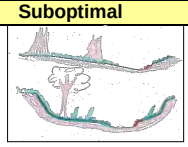
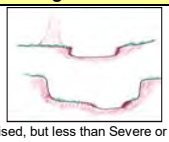
Unified Stream Methodology for use in Virginia

For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
203401129	NOVEC Wildwood Substation	Loudoun	R4	02070008	3/11/2020	1	77	1

Name(s) of Evaluator(s)	Stream Name and Information
J. Mann	Unnamed first order tributary to Goose Creek

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

	Conditional Category					
	Optimal	Suboptimal	Marginal	Poor	Severe	
Channel Condition	 Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	 Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	 Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may bevertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	 Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	 Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	2.0
NOTES>>						

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

	Conditional Category							NOTES>>
	Optimal	Suboptimal		Marginal		Poor		
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.	
		High	Low	High	Low	High	Low	
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5	

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	100%						100%	
	Score >	1.2							
									CI= (Sum % RA * Scores*0.01)/2
Left Bank	% Riparian Area>	100%						100%	Rt Bank CI > 1.20 — CI
	Score >	1.2							Lt Bank CI > 1.20 — 1.20

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

	Conditional Category				NOTES>>
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	CI
Score	1.5	1.2	0.9	0.5	0.50

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock							**NOTES>>**	
	Conditional Category							
	Negligible	**Minor**		**Moderate**		**Severe**		
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.		
SCORE	**1.5**	**1.3**	**1.1**	**0.9**	**0.7**	**0.5**		**1.50**

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**

THE REACH CONDITION INDEX (RCI) >>	**1.04**
RCI= (Sum of all CI's)/5	
COMPENSATION REQUIREMENT (CR) >>	**80**
CR = RCI X LF X IF	

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Impact is associated with the construction of a 8.6 ft tall retaining wall on the northeast corner of the pad site. The wall was designed to avoid impacts to the perennial stream.

Stream Assessment Form (Form 1)

Unified Stream Methodology for use in Virginia

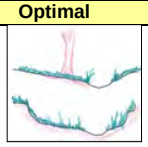
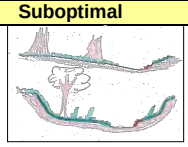
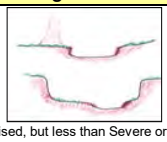
For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
203401129	NOVEC Wildwood Substation	Loudoun	R4	02070008	3/11/2020	2	238	1

Name(s) of Evaluator(s)	Stream Name and Information
J. Mann	Unnamed first order tributary to Goose Creek

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

Conditional Category

	Optimal	Suboptimal	Marginal	Poor	Severe	
Channel Condition	 Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	 Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	 Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may bevertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	 Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	 Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	2.0
NOTES>>						

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

	Conditional Category							NOTES>>
	Optimal	Suboptimal		Marginal		Poor		
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.	
		High	Low	High	Low	High	Low	
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5	

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	100%						100%			
	Score >	1.2									
									CI= (Sum % RA * Scores*0.01)/2		
Left Bank	% Riparian Area>	70%	30%					100%	Rt Bank CI >	1.20	CI
	Score >	1.2	1.5						Lt Bank CI >	1.29	1.25

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

NOTES>>

	Conditional Category				
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	CI
Score	1.5	1.2	0.9	0.5	0.50

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock							**NOTES>>**	
	Conditional Category							
	Negligible	**Minor**		**Moderate**		**Severe**		
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.		
SCORE	**1.5**	**1.3**	**1.1**	**0.9**	**0.7**	**0.5**		**1.50**

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH	
NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**	**THE REACH CONDITION INDEX (RCI) >>** **1.05**
	RCI= (Sum of all CI's)/5
	COMPENSATION REQUIREMENT (CR) >> **250**
	CR = RCI X LF X IF

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Impact is associated with the substation pad site, stormwater management pipes, bioretention facilities and grading to maintain a stable slope along the perennial stream system.

Stream Assessment Form (Form 1)

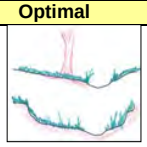
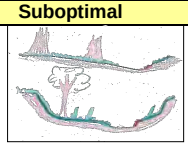
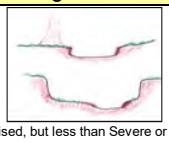
Unified Stream Methodology for use in Virginia

For use in wadeable channels classified as intermittent or perennial

Project #	Project Name	Locality	Cowardin Class.	HUC	Date	SAR #	Impact/SAR length	Impact Factor
203401129	NOVEC Wildwood Substation	Loudoun	R4	02070008	3/11/2020	3	194	1

Name(s) of Evaluator(s)	Stream Name and Information
J. Mann	Unnamed first order tributary to Goose Creek

1. Channel Condition: Assess the cross-section of the stream and prevailing condition (erosion, aggradation)

	Conditional Category					
	Optimal	Suboptimal	Marginal	Poor	Severe	
Channel Condition	 Very little incision or active erosion; 80-100% stable banks. Vegetative surface protection or natural rock, prominent (80-100%). AND/OR Stable point bars/bankfull benches are present. Access to their original floodplain or fully developed wide bankfull benches. Mid-channel bars, and transverse bars few. Transient sediment deposition covers less than 10% of bottom.	 Slightly incised, few areas of active erosion or unprotected banks. Majority of banks are stable (60-80%). Vegetative protection or natural rock prominent (60-80%) AND/OR Depositional features contribute to stability. The bankfull and low flow channels are well defined. Stream likely has access to bankfull benches, or newly developed floodplains along portions of the reach. Transient sediment covers 10-40% of the stream bottom.	 Often incised, but less than Severe or Poor. Banks more stable than Severe or Poor due to lower bank slopes. Erosion may be present on 40-60% of both banks. Vegetative protection on 40-60% of banks. Streambanks may bevertical or undercut. AND/OR 40-60% of stream is covered by sediment. Sediment may be temporary/transient, contribute instability. Deposition that contribute to stability, may be forming/present. AND/OR V-shaped channels have vegetative protection on > 40% of the banks and depositional features which contribute to stability.	 Overwidened/incised. Vertically/laterally unstable. Likely to widen further. Majority of both banks are near vertical. Erosion present on 60-80% of banks. Vegetative protection present on 20-40% of banks, and is insufficient to prevent erosion. AND/OR 60-80% of the stream is covered by sediment. Sediment is temporary/transient in nature, and contributing to instability. AND/OR V-shaped channels have vegetative protection is present on > 40% of the banks and stable sediment deposition is absent.	 Deeply incised (or excavated), vertical/lateral instability. Severe incision, flow contained within the banks. Streambed below average rooting depth, majority of banks vertical/undercut. Vegetative protection present on less than 20% of banks, is not preventing erosion. Obvious bank sloughing present. Erosion/raw banks on 80-100%. AND/OR Aggrading channel. Greater than 80% of stream bed is covered by deposition, contributing to instability. Multiple thread channels and/or subterranean flow.	CI
Score	3	2.4	2	1.6	1	2.0
NOTES>>						

2. RIPARIAN BUFFERS: Assess both bank's 100 foot riparian areas along the entire SAR. (rough measurements of length & width may be acceptable)

	Conditional Category							NOTES>>
	Optimal	Suboptimal		Marginal		Poor		
Riparian Buffers	Tree stratum (dbh > 3 inches) present, with > 60% tree canopy cover and a non-maintained understory. Wetlands located within the riparian areas.	**High Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with 30% to 60% tree canopy cover and containing both herbaceous and shrub layers or a non-maintained understory.	**Low Suboptimal:** Riparian areas with tree stratum (dbh > 3 inches) present, with > 30% tree canopy cover and a maintained understory. Recent cutover (dense vegetation).	**High Marginal:** Non-maintained, dense herbaceous vegetation with either a shrub layer or a tree layer (dbh > 3 inches) present, with <30% tree canopy cover.	**Low Marginal:** Non-maintained, dense herbaceous vegetation, riparian areas lacking shrub and tree stratum, hay production, ponds, open water. If present, tree stratum (dbh >3 inches) present, with <30% tree canopy cover with maintained understory.	**High Poor:** Lawns, mowed, and maintained areas, nurseries; no-till cropland; actively grazed pasture, sparsely vegetated non-maintained area, recently seeded and stabilized, or other comparable condition.	**Low Poor:** Impervious surfaces, mine spoil lands, denuded surfaces, row crops, active feed lots, trails, or other comparable conditions.	
		High	Low	High	Low	High	Low	
Condition Scores	1.5	1.2	1.1	0.85	0.75	0.6	0.5	

1. Delineate riparian areas along each stream bank into Condition Categories and Condition Scores using the descriptors.
2. Determine square footage for each by measuring or estimating length and width. Calculators are provided for you below.
3. Enter the % Riparian Area and Score for each riparian category in the blocks below.

Ensure the sums of % Riparian Blocks equal 100

Right Bank	% Riparian Area>	70%	20%	10%				100%		
	Score >	1.2	0.6	1.5						
									CI= (Sum % RA * Scores*0.01)/2	
Left Bank	% Riparian Area>	60%	20%	20%				100%	Rt Bank CI >	1.11
	Score >	1.5	1.5	0.6					Lt Bank CI >	1.32

		CI
		1.22

3. INSTREAM HABITAT: Varied substrate sizes, water velocity and depths; woody and leafy debris; stable substrate; low embededness; shade; undercut banks; root mats; SAV; riffle poole complexes, stable features.

	Conditional Category				NOTES>>
	Optimal	Suboptimal	Marginal	Poor	
Instream Habitat/ Available Cover	Habitat elements are typically present in greater than 50% of the reach.	Stable habitat elements are typically present in 30-50% of the reach and are adequate for maintenance of populations.	Stable habitat elements are typically present in 10-30% of the reach and are adequate for maintenance of populations.	Habitat elements listed above are lacking or are unstable. Habitat elements are typically present in less than 10% of the reach.	
Score	1.5	1.2	0.9	0.5	

	CI
	1.20

Stream Impact Assessment Form Page 2

Project #	Applicant	Locality	Cowardin Class.	HUC	Date	Data Point	SAR length	Impact Factor

4. CHANNEL ALTERATION: Stream crossings, riprap, concrete, gabions, or concrete blocks, straightening of channel, channelization, embankments, spoil piles, constrictions, livestock							**NOTES>>**	
	Conditional Category							
	Negligible	**Minor**		**Moderate**		**Severe**		
Channel Alteration	Channelization, dredging, alteration, or hardening absent. Stream has an unaltered pattern or has naturalized.	Less than 20% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	20-40% of the stream reach is disrupted by any of the channel alterations listed in the parameter guidelines.	40 - 60% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	60 - 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines. If stream has been channelized, normal stable stream meander pattern has not recovered.	Greater than 80% of reach is disrupted by any of the channel alterations listed in the parameter guidelines AND/OR 80% of banks shored with gabion, riprap, or cement.		
SCORE	**1.5**	**1.3**	**1.1**	**0.9**	**0.7**	**0.5**		**1.50**

REACH CONDITION INDEX and STREAM CONDITION UNITS FOR THIS REACH

NOTE: **The CIs and RCI should be rounded to 2 decimal places. The CR should be rounded to a whole number.**

THE REACH CONDITION INDEX (RCI) >>	**1.18**
RCI= (Sum of all CI's)/5	
COMPENSATION REQUIREMENT (CR) >>	**229**
CR = RCI X LF X IF	

INSERT PHOTOS:

DESCRIBE PROPOSED IMPACT:

Impact associated with the installation of a 24-inch RCP approximately 115 ft in length with a riprap outfall.

Northern Virginia Stream Restoration Bank - Credit Estimation Form

Project Name: NOVEC Wildwood Substation

Date: 9/15/2020

Prepared For: Robert Bisson

Company: NOVEC

Prepared By: Amber Forestier

Please send completed form to Jennifer Van Houten:

Impact	Stream Type[1]	Impact RCI RCI_{USM}	Equivalency Factor[2] EF	Impact Length L_I (linear ft)	Impact Factor[3] IF	Impact Drainage Area DA_{WI} (acres)	Compensation Drainage Area[4] DA_{WC} (acres)	Correlation Factor[5] $CF = (DA_{WI}/DA_{WC})^{0.39}$	Required Compensation[6] CMP_T (SCUs)
Section I.									
PG3	R4	1.04	2.52	77	1.00	14	210	0.53	164
PG4	R4	1.05	2.55	238	1.00	8	210	0.53	506
PR3	R4	1.18	2.95	194	1.00	12	210	0.53	412
Section II. Case-by-Case Determinations for Ephemeral (RE) and Man-Made Channels (MM) [6]									
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
			---		N/A	N/A	N/A	N/A	
TOTALS				**509**					**1,082**

[1] Stream Type designations are as follows: R3 = Perennial; R4 = Intermittent; RE = Ephemeral; MM = Man-Made, COMP = Composite (i.e. combination of stream types)

[2] $EF = [2.398 * (RCI_{USM})^{1.2619}]$

[3] Impact Factor (IF) shall be assigned pursuant to the Unified Stream Methodology for Use in Virginia Final Draft For Implementation, January 2007 (USM), Section 2.0.

[4] The Compensation Drainage Area is the average drainage area for Phase I of the Northern Virginia Stream Restoration Bank per the Bank's Concept Plan dated May 15, 2006.

[5] If (D_{WI}/D_{WC}) is less than 0.2 then the Correlation Factor equals 0.53. If (D_{WI}/D_{WC}) is greater than 3.0 then the Correlation Factor equals 1.53. If (D_{WI}/D_{WC}) is between 0.2 and 3.0 then the Correlation Factor equals $(DWI/DWC)^{0.39.}$

[6] For all stream types, If $RCI_{USM} * EF * CF < 2.125$, Then $CMP_T = 2.125 * L_I * IF$

For all stream types, If $RCI_{USM} * EF * CF \geq 2.125$, Then $CMP_T = RCI_{USM} * EF * CF * L_I * IF$

(According to the USM, Pages 2 and 3, compensation requirements for RE and man-made channels are evaluated on a case-by-case basis. The credit purchaser may negotiate, with the COE and DEQ< a lower mitigation requriement than the calculations provided in Section I. If you chose to do so, use Section II to input the negotiated value for the "Required Compensation" (in terms of SCUs) and calculate the resulting mitigation cost).

January 26, 2021

Ms. Amber Forestier
Regulatory Specialist
Stantec
150 Riverside Parkway Suite 301
Fredericksburg VA 22406-1094

Re: Credit Availability Letter to Provide Wetland Credits
Loudoun County, Virginia

Dear Ms. Forestier:

We would like to acknowledge that the Cedar Run Wetlands Bank currently has 0.99 wetland credits available for purchase for the above referenced project. They will be reserved when a mutually satisfactory binding contract with a deposit is signed by both parties; until that time, they may be sold to other third parties and will not be reserved in our internal ledgers or RIBITS for the referenced project.

Sincerely,

CEDAR RUN WETLANDS, L.C
a Virginia limited liability company

By: Jennifer Van Houten
Jennifer Van Houten, authorized signatory

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5300 Wellington Branch Drive • Suite 100 • Gainesville, VA 20155 • Phone 703.679.5641 • Fax 703.679.5601
jvanhouten@wetlandstudies.com • www.wetlandstudies.com

Received by VMRC February 4, 2021 /blh

January 26, 2021

Ms. Amber Forestier
Regulatory Specialist
Stantec
150 Riverside Parkway Suite 301
Fredericksburg VA 22406-1094

Re: Credit Availability Letter to Provide Stream Credits
Loudoun County, VA

Dear Ms. Forestier,

We would like to acknowledge that the Northern Virginia Stream Restoration Bank currently has 1,082 stream condition units (SCUs) available for purchase for the above referenced project. They will be reserved when a mutually satisfactory binding contract with a deposit is signed by both parties; until that time, they may be sold to other third parties and will not be reserved in our internal ledgers or RIBITS for the referenced project.

Sincerely,

NORTHERN VIRGINIA STREAM
RESTORATION, L.C.
a Virginia limited liability company

By: _____
Jennifer Van Houten, Business Analyst

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Received by VMRC February 4, 2021 /blh